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For related information see also *Astronautics*.

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VOLUME 22 NUMBER 22/NOVEMBER 23, 1984

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 3529

02 AERODYNAMICS 3529

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For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 3532

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 3533

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 3534

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For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 3535

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For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 3536

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For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 3537

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09 RESEARCH AND SUPPORT FACILITIES (AIR) 3538

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For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) 3539

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 3539

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 3539

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15 LAUNCH VEHICLES AND SPACE VEHICLES 3540

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16 SPACE TRANSPORTATION 3541

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18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3542

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

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For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

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Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 3544
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 3545
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 3550
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 3557
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 3561
Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

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31 ENGINEERING (GENERAL) 3563
Includes vacuum technology; control engineering, display engineering; and cryogenics.

32 COMMUNICATIONS 3571
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 3580
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuity.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 3591
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

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Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 3600
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 3602
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 3606
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 3607
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

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For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 3613
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 3615
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 3619
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 3620
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 3624
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48 OCEANOGRAPHY 3627
Includes biological, dynamic and physical oceanography; and marine resources.

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51 LIFE SCIENCES (GENERAL) 3628
Includes genetics.

52 AEROSPACE MEDICINE 3630
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Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

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Includes human engineering; biotechnology; and space suits and protective clothing.

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59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) 3633

60 COMPUTER OPERATIONS AND HARDWARE 3637
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE 3639
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 3643
Includes computer networks.

63 CYBERNETICS 3643
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS 3644
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 3647
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 3649
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 3650
Includes topology and number theory.

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For related information see also *Engineering.*

70 PHYSICS (GENERAL) 3651
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS 3651
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 3653
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 3654
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 3655
Includes light phenomena.

75 PLASMA PHYSICS 3658
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 3661
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 3668
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

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Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 3668
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 3669
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 3675
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 3676
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3676
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 3677
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3677
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3678
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3679
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3680
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

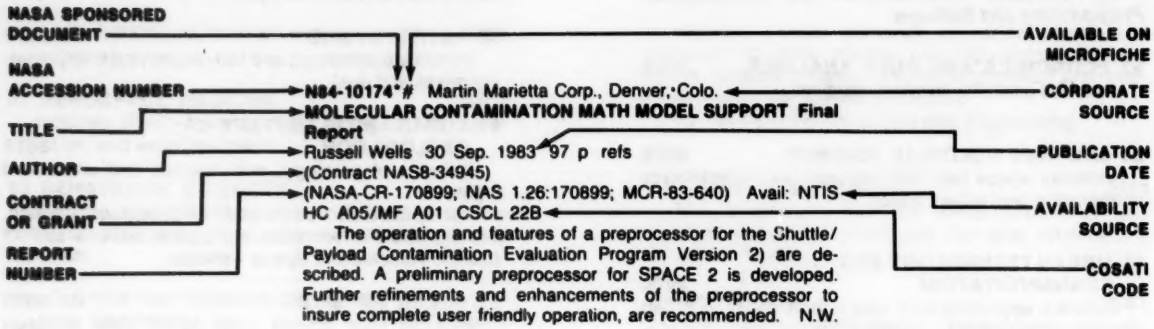
GENERAL

99 GENERAL 3681

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-61
CORPORATE SOURCE INDEX I-69
CONTRACT NUMBER INDEX I-81
REPORT/ACCESSION NUMBER INDEX I-85

TYPICAL CITATION AND ABSTRACT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COSATI CODE
N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 22 / NOVEMBER 23, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-32342* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 177)
Aug. 1984 131 p
(NASA-SP-7037(177); NAS 1.21:7037(177)) Avail: NTIS HC $6.00 CSCL 01A

This bibliography lists 469 reports, articles and other documents introduced into the NASA scientific and technical information system in July 1984. M.G.

N84-32343* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Sep. 1984 121 p
(NASA-SP-7037(178); NAS 1.21:7037(178)) Avail: NTIS HC A06/MF A01 CSCL 01A

This bibliography lists 426 reports, articles and other documents introduced into the NASA scientific and technical information system in August 1984. Reports are cited in the area of Aeronautical Engineering. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing operation and performance of aircraft (including aircraft engines) and associated components, equipment and systems. B.W.

N84-32344*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF RECENT NASA PROPELLER RESEARCH
Daniel C. Mikkelson, Glenn A. Mitchell, and Lawrence J. Bober 1984 38 p refs Proposed for presentation at the AGARD Fluid Dyn. Panel Meeting on Aerodyn. and Acoustics of Propellers, Toronto, 1-4 Oct. 1984
(NASA-TM-83733; E-2216; NAS 1.15:83733) Avail: NTIS HC A03/MF A01 CSCL 01B

Advanced high-speed propellers offer large performance improvements for aircraft that cruise in the Mach 0.7 to 0.8 speed regime. At these speeds, studies indicate that there is a 15 to near 40 percent block fuel savings and associated operating cost benefits for advanced turboprops compared to equivalent technology turbofan powered aircraft. Recent wind tunnel results for five eight to ten blade advanced models are compared with analytical predictions. Test results show that blade sweep was important in achieving net efficiencies near 80 percent at Mach 0.8 and reducing nearfield cruise noise by about 6 dB. Lifting line and lifting surface aerodynamic analysis codes are under development and some results are compared with propeller force and probe data. Also, analytical predictions are compared with some initial laser velocimeter measurements of the flow field velocities of an eightbladed 45 swept propeller. Experimental aeroelastic results indicate that cascade effects and blade sweep strongly affect propeller aeroelastic characteristics. Comparisons of propeller near-field noise data with linear acoustic theory indicate that the theory adequately predicts near-field noise for subsonic tip speeds but overpredicts the noise for supersonic tip speeds. B.W.

N84-32345# SRI International Corp., Menlo Park, Calif.
ARTIFICIAL INTELLIGENCE-ROBOTICS APPLICATIONS TO NAVY AIRCRAFT MAINTENANCE Final Report, 1 Jan. 1983 - 30 Apr. 1984
D. R. Brown, R. H. Monahan, and W. T. Park Jun. 1984 200 p
(Contract N00600-82-D-8362)
(AD-A143219; SRI-4905; DTNSRDC/CMLD-CR-53-84) Avail: NTIS HC A09/MF A01 CSCL 05/1

The general objective of this study was to develop a data base and methodology of assessing Artificial Intelligence (AI) robotic applications to Naval aircraft maintenance. The research was conducted in three phases: Survey of AI/Robotics, AI/Robotic Opportunities and Design Concepts, and Cost-Benefit Methodology. Chapter 2 of this report presents a summary description of the AI/Robotic technologies that are relevant to Naval aircraft maintenance. The detailed survey of AI/robotic technologies is presented in Appendix A of this report. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-32346 Mississippi State Univ., State College.
THREE-DIMENSIONAL, TIME-DEPENDENT, COMPRESSIBLE, TURBULENT, INTEGRAL BOUNDARY LAYER EQUATIONS IN GENERAL CURVILINEAR COORDINATES AND THEIR NUMERICAL SOLUTIONS Ph.D. Thesis
Timothy Wade Swafford 1983 142 p
Avail: Univ. Microfilms Order No. DA8410682

A method is presented for computing three dimensional, time-dependent, compressible, turbulent boundary layers in nonorthogonal curvilinear coordinates. An integral method is employed in the interest of computational speed and because the three dimensional method is an extension of an existing two-dimensional method. After presenting a detailed derivation of the integral form of the boundary layer equations, the necessary auxiliary relations are given along with the relationships between integral lengths expressed in streamline and nonorthogonal coordinates. A time dependent approach is used to account for time accuracy (if desired) and to provide a method that is compatible with the surface grid used by an inviscid solver for use in viscous-inviscid interaction calculations. The equations are solved using a Runge-Kutte scheme with local time stepping to accelerate convergence. Dissert. Abstr.

N84-32347 Boston Univ., Mass.
AN INTEGRAL EQUATION FOR THE SOLUTION OF NONLINEAR WAVE EQUATIONS Ph.D. Thesis
Dave Deutsch 1984 123 p
Avail: Univ. Microfilms Order No. DA8411029

The theory of distributions is used to present a derivation of the Green's function integral equation for potential aerodynamics. The integral equation is used to compute the velocity potential of an ideal fluid as it moves about the surface of an aircraft in the transonic regime. A proof is presented to justify the shock capturing nature of the integral equation. The proof incorporates the notion of weak solutions of the transonic small perturbation equation. Also a derivation is presented of the Green's function integral equation in a frame of reference that moves along a smooth path in rigid body motion. The integral equation in the moving frame of reference is based upon a technique developed in acoustics by Ffowcs-Williams and Hawkings. This integral equation is suitable for computing the velocity potential about aircrafts moving in complex flight paths as well as helicopter rotors. Dissert. Abstr.

N84-32348*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUBSONIC AND TRANSONIC UNSTEADY- AND STEADY-PRESSURE MEASUREMENTS ON A RECTANGULAR SUPERCRITICAL WING OSCILLATED IN PITCH
Rodney H. Rickets, Maynard C. Sandford, Judith J. Watson, and David A. Seidel Washington Aug. 1984 405 p refs A magnetic tape is included as supplement
(NASA-TM-85765; L-15773; NAS 1.15:85765; PB85-102135) Avail: NTIS HC A18/MF A01; magnetic tape is available as PB85-102135 $140.00 CSCL 01A

Unsteady and steady pressure measurements are presented for a rectangular planform supercritical wing with an aspect ratio of 4.0. The wing was oscillated about the wing pitch axis located at 46 percent chord in the Langley Transonic Dynamics Tunnel. Dynamic response measurements of the motion of the wing during oscillation are also presented. Test Mach numbers ranged from 0.27 to 0.90. Static angles of attack ranged from -4 deg to 14 deg. Oscillation frequencies ranged from 2 to 20 Hz, and amplitudes ranged from 0.5 to 1.5 deg about zero and nonzero mean angles. Release of these data is intended to aid in the development and evaluation of analytical transonic codes. Author

N84-32349*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FAST SOLUTIONS TO THE STEADY STATE COMPRESSIBLE AND INCOMPRESSIBLE FLUID DYNAMIC EQUATIONS Final Report
Eli Turkel Jun. 1984 10 p refs
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172416; ICASE-84-28; NAS 1.26:172416) Avail: NTIS HC A02/MF A01 CSCL 01A

For low speed flows the use of the compressible fluid dynamic equations is inefficient. The use of an explicit scheme requires delta t to be bounded by 1/c. However, the physical parameters change over time scales of order 1/u which is much larger. Hence, it is not appropriate to use explicit schemes for very subsonic flows. Implicit schemes are hard to vectorize and frequently do not converge quickly for very subsonic flows. If one is only interested in the steady state then a minor change to an existing code can greatly increase the efficiency of an explicit method. Even when using an implicit method the proposed changes increase the efficiency of the scheme. The Euler equations for low speed flows will be considered first and then incompressible flows. The method is generalized to include viscous effects. Supersonic flow is accelerated by essentially decoupling the equations. Author

N84-32350*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPROVEMENTS IN THE ACCURACY AND STABILITY OF ALGORITHMS FOR THE SMALL-DISTURBANCE AND FULL-POTENTIAL EQUATIONS APPLIED TO TRANSONIC FLOWS
Peter M. Goorjian Jun. 1984 8 p refs
(NASA-TM-85970; A-9778; NAS 1.15:85970) Avail: NTIS HC A02/MF A01 CSCL 01A

Numerical techniques that improve the accuracy and stability of algorithms for the small disturbance and full potential equations used to calculate transonic flows are described. For the small disturbance equation, the algorithm improvements are: (1) the use of monotone switches in the type dependent finite differencing, and (2) the use of stable and simple second order accurate spatial differencing; these improvements are for steady and unsteady transonic flows. For the steady full potential equation, the improvement is in the use of a monotone switch in the type dependent finite differencing of an approximate factorization (AF2) algorithm. All these improvements are implemented in present computer codes by making minor coding modifications. Author

N84-32351*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNSTEADY TRANSONIC FLOW IN CASCADES
Surya P. Surampudi (Cleveland State Univ.) and John J. Adamczyk 1984 8 p refs Presented at the Unsteady Aerodyn. of Turbomachines and propellers, Cambridge, England, 24-27 Sep. 1983; sponsored by IUTAM
(NASA-TM-83780; E-2272; NAS 1.15:83780) Avail: NTIS HC A02/MF A01 CSCL 01A

There is a need for methods to predict the unsteady air loads associated with flutter of turbomachinery blading at transonic speeds. The results of such an analysis in which the steady relative flow approaching a cascade of thin airfoils is assumed to be transonic, irrotational, and isentropic is presented. The blades in the cascade are allowed to undergo a small amplitude harmonic oscillation which generates a small unsteady flow superimposed on the existing steady flow. The blades are assumed to oscillate with a prescribed motion of constant amplitude and interblade phase angle. The equations of motion are obtained by linearizing about a uniform flow the inviscid nonheat conducting continuity and momentum equations. The resulting equations are solved by employing the Weiner Hopf technique. The solution yields the unsteady aerodynamic forces acting on the cascade at Mach number equal to 1. Making use of an unsteady transonic similarity law, these results are compared with the results obtained from linear unsteady subsonic and supersonic cascade theories. A parametric study is conducted to find the effects of reduced frequency, solidity, stagger angle, and position of pitching axis on the flutter. Author

N84-32352*# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
INVESTIGATION OF THE EXTERNAL FLOW ANALYSIS FOR DENSITY MEASUREMENTS AT HIGH ALTITUDE Final Report, 1 Jul. 1979 - 31 Aug. 1982
George K. Bienkowski [1983] 225 p refs
(Grant NsG-1630)
(NASA-CR-173881; NAS 1.26:173881) Avail: NTIS HC A10/MF A01 CSCL 01A

A Monte Carlo program was developed for modeling the flow field around the space shuttle in the vicinity of the shuttle upper atmosphere mass spectrometer experiment. The operation of the EXTERNAL code is summarized. Issues associated with geometric modeling of the shuttle nose region and the modeling of intermolecular collisions including rotational energy exchange are discussed as well as a preliminary analysis of vibrational excitation and dissociation effects. The selection of trial runs is described and the parameters used for them is justified. The original version and the modified INTERNAL code for the entrance problem are reviewed. The code listing is included. A.R.H.

N84-32353*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIENCE WITH TRANSONIC UNSTEADY AERODYNAMIC CALCULATIONS
J. W. Edwards, S. R. Bland, and D. A. Seidel Aug. 1984 23 p refs Presented at the 59th Meeting of the AGARD Struct. and Mater. Panel of the Spec. Meeting on Transonic Unsteady Aerodyn.

and its Aeroelastic Appl., Toulouse, 2-7 Sep. 1984
(NASA-TM-86278; NAS 1.15:86278) Avail: NTIS HC A02/MF A01 CSCL 01A

Comparisons of calculated and experimental transonic unsteady pressures and airloads for four of the AGARD Two Dimensional Aeroelastic Configurations and for a rectangular supercritical wing are presented. The two dimensional computer code, XTRAN2L, implementing the transonic small perturbation equation was used to obtain results for: (1) pitching oscillations of the NACA 64A010A; NLR 7301 and NACA 0012 airfoils; (2) flap oscillations for the NACA 64A006 and NRL 7301 airfoils; and (3) transient ramping motions for the NACA 0012 airfoils. Results from the three dimensional code XTRAN3S are compared with data from a rectangular supercritical wing oscillating in pitch. These cases illustrate the conditions under which the transonic inviscid small perturbation equation provides reasonable predictions. Author

N84-32354*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FUSELAGE AND NOZZLE PRESSURE DISTRIBUTIONS OF A 1/12-SCALE F-15 PROPULSION MODEL AT TRANSONIC SPEEDS. EFFECT OF FUSELAGE MODIFICATIONS AND NOZZLE VARIABLES
Odis C. Pendergraft, Jr. and George T. Carson, Jr. Aug. 1984 469 p
(NASA-TP-2333; L-15755; NAS 1.60:2333) Avail: NTIS HC A20/MF A01 CSCL 01A

Static pressure coefficient distributions on the forebody, afterbody, and nozzles of a 1/12 scale F-15 propulsion model was determined in the 16 foot transonic tunnel for Mach numbers from 0.60 to 1.20, angles of attack from -2 deg to 7 deg and ratio of jet total pressure to free stream static pressure from 1 up to about 7, depending on Mach number. The effects of nozzle geometry and horizontal tail deflection on the pressure distributions were investigated. Boundary layer total pressure profiles were determined at two locations ahead of the nozzles on the top nacelle surface. Reynolds number varied from about 1.0 x 10 to the 7th power per meter, depending on Mach number. E.A.K.

N84-32355*# United Technologies Research Center, East Hartford, Conn.
A LINEAR AERODYNAMIC ANALYSIS FOR UNSTEADY TRANSONIC CASCADES Final Report
Joseph M. Verdon and Joseph R. Caspar Washington NASA Sep. 1984 80 p refs
(Contract NAS3-23696)
(NASA-CR-3833; E-2202; NAS 1.26:3833; R84-956393-8) Avail: NTIS HC A05/MF A01 CSCL 01A

A potential flow analysis to predict unsteady airloads produced by the vibrations of turbomachinery blades operating at transonic Mach numbers is presented. The unsteady aerodynamic model includes the effects of blade geometry, finite mean pressure variation across the blade row, high frequency blade motion, and shock motion within the framework of a linearized, frequency domain formulation. The unsteady equations are solved implicit, least squares, finite difference approximation which is applicable on arbitrary grids. A numerical solution for the entire unsteady field is determined by matching a solution determined on a rectilinear type cascade mesh, which covers an extended blade passage region, to a solution determined on a detailed polar type local mesh, which covers and extends well beyond the supersonic region(s) adjacent to a blade surface. Cascades of double circular arc and flat plate blades demonstrate the unsteady analysis, and partially illustrate the effects of blade geometry, inlet Mach number, blade vibration frequency and shock motion on unsteady response. E.A.K.

N84-32356*# New York Univ., New York. Inst. of Mathematical Sciences.
ANALYSIS OF THREE-DIMENSIONAL TRANSONIC COMPRESSORS
Antoine Bourgeade Feb. 1984 110 p refs
(Grant NGR-33-016-201)
(NASA-CR-166580; NAS 1.26:166580) Avail: NTIS HC A06/MF A01 CSCL 01A

A method for computing the three-dimensional transonic flow around the blades of a compressor or of a propeller is given. The method is based on the use of the velocity potential, on the hypothesis that the flow is inviscid, irrotational and isentropic. The equation of the potential is solved in a transformed space such that the surface of the blade is mapped into a plane where the periodicity is implicit. This equation is in a nonconservative form and is solved with the help of a finite difference method using artificial time. A computer code is provided and some sample results are given in order to demonstrate the influence of three-dimensional effects and the blade's rotation. R.J.F.

N84-32357*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INVESTIGATION OF THE THREE-DIMENSIONAL FLOW FIELD WITHIN A TRANSONIC FAN ROTOR: EXPERIMENT AND ANALYSIS
Michael J. Pierzga and Jerry R. Wood 1984 26 p refs Presented at the 29th Ann. Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984; sponsored by ASME Prepared in cooperation with Army Research and Technology Labs., Cleveland
(NASA-TM-83739; E-2150; NAS 1.15:83739; USAAVSCOM-TR-83-C-16) Avail: NTIS HC A03/MF A01 CSCL 01A

An experimental investigation of the three dimensional flow field through a low aspect ratio, transonic, axial flow fan rotor has been conducted using an advanced laser anemometer (LA) system. Laser velocimeter measurements of the rotor flow field at the design operating speed and over a range of through flow conditions are compared to analytical solutions. The numerical technique used herein yields the solution to the full, three dimensional, unsteady Euler equations using an explicit time marching, finite volume approach. The numerical analysis, when coupled with a simplified boundary layer calculation, generally yields good agreement with the experimental data. The test rotor has an aspect ratio of 1.56, a design total pressure ratio of 1.629 and a tip relative Mach number of 1.38. The high spatial resolution of the LA data matrix (9 radial by 30 axial by 50 blade to blade) permits details of the transonic flow field such as shock location, turning distribution and blade loading levels to be investigated and compared to analytical results. Author

N84-32358*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATION OF TRANSONIC SEPARATED AIRFOIL FLOW BY FINITE DIFFERENCE VISCOUS-INVISCID INTERACTION
William R. VanDalsem and Joseph L. Steger Jun. 1984 9 p refs
(NASA-TM-85980; A-9812; NAS 1.15:85980) Avail: NTIS HC A02/MF A01 CSCL 01A

A finite difference viscous inviscid interaction program has been developed for simulating the separated transonic flow about lifting airfoils, including the wake. In contrast to most interaction programs, this code combines a finite difference boundary layer algorithm with the inviscid program. The recently developed finite difference boundary layer code efficiently simulates attached and reversed compressible boundary layer and wake flows. New viscous inviscid interaction algorithms were also developed to couple the boundary layer code with the inviscid transonic full potential program. Transonic cases with shock induced and trailing edge separation are computed and compared with experimental and Navier-Stokes results. Author

N84-32359# Aerotherm Acurex Corp., Mountain View, Calif.
AERODYNAMIC HEATING COMPUTATIONS FOR PROJECTILES. VOLUME 1: IN-DEPTH HEAT CONDUCTION MODIFICATIONS TO THE ABRES SHAPE CHANGE CODE (BRLASCC) Final Report
W. S. Kobayashi Jun. 1984 124 p 3 Vol.
(Contract DAAK11-81-C-0064; DA Proj. 1L1-62618-AH-80)
(AD-A143252; AD-F300438; ARBRL-CR-00527) Avail: NTIS

HC A06/MF A01 CSCL 19/1

The BRL has recently applied to ABRES Shape Change Code (ASCC80) to predict the unsteady thermal response of high velocity projectile nose configurations due to aerodynamic heating. The initial application of the ASCC80 code revealed several deficiencies as applied to slender shapes of interest for Army shell. This report describes the modifications carried out that improve the capabilities of the code to address problems for Army shell. Test cases and detailed instructions are provided which describe the input data required to run the code. GRA

N84-32360# Aerotherm Acurex Corp., Mountain View, Calif.
AERODYNAMIC HEATING COMPUTATIONS FOR PROJECTILES. VOLUME 2: SWEPT WING CALCULATIONS USING THE PLANAR VERSION OF THE ABRES SHAPE CHANGE CODE (PLNRASCC) Final Report
R. C. Strawn and W. S. Kobayashi Jun. 1984 89 p 3 Vol.
(Contract DAAK11-81-C-0064; DA Proj. 1L1-62618-AH-80)
(AD-A143253; AD-F300439; ARBRL-CR-00528) Avail: NTIS HC A05/MF A01 CSCL 19/1

This report documents modifications and additions incorporated into the ABRES Shape Change Code (ASCC80) to create a planar two-dimensional version of the axisymmetric computer code. This planar code predicts convective heat transfer and in-depth conduction for swept wings in supersonic flow. The report contains test cases and a detailed user's guide which describes the input data required to run the code. GRA

N84-32361# Aerotherm Acurex Corp., Mountain View, Calif.
AERODYNAMIC HEATING COMPUTATIONS FOR PROJECTILES. VOLUME 3: BRL INTERACTIVE PLOTTING PROGRAM (BRLINPLOT) Final Report
R. A. S. Beck Jun. 1984 68 p 3 Vol.
(Contract DAAK11-81-C-0064; DA Proj. 1L1-62618-AH-80)
(AD-A143254; AD-F300440; ARBRL-CR-00529) Avail: NTIS HC A04/MF A01 CSCL 19/1

This report describes the development of an interactive plotting and grid generation program for generating input data for the ARBRES Shape Change Code. The program as developed can provide grid input data for ASCC80 as well as the modified codes BRLASCC and PLNRASCC. The report contains test cases and a detailed user's guide which describes the input data required to run the code. GRA

N84-32362# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SUPERSONIC FLOWS AROUND A CIRCULAR CONE WITH OR WITHOUT BLOWING ON THE SURFACE
E. Carafoli, C. Berbente, and P. Marinescu 2 Jul. 1984 26 p Transl. into ENGLISH from Stud. si Cercet. de Mec. Apl. (Romania), v. 36, no. 2, Mar.-Apr. 1977 p 163-180
(AD-A143258; FTD-ID(RS)T-0731-84) Avail: NTIS HC A03/MF A01 CSCL 20/4

The flow around a straight circular cone with or without blowing in the presence of a supersonic current parallel to the axis of symmetry is considered. First, the case of a solid circular cone for which a nearly exact solution is found for the equation of motion is addressed. In addition, the flow around a permeable porous cone with suction or normal injection on the surface is discussed. The results apply directly to the calculation of the fuselage of supersonic and jet aircraft and the thermal protection of the tip of aircraft by sonic injection or by the injection of a liquid or gas. R.S.F.

N84-32363# Oregon State Univ., Corvallis. Dept. of Mechanical Engineering.
CALCULATION OF THE PRESSURE DISTRIBUTION ON A PITCHING AIRFOIL WITH APPLICATION TO THE DARRIEUS ROTOR
N. Ghodoosian May 1984 130 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013571; SAND-84-7001) Avail: NTIS HC A07/MF A01

An analytical model leading to the pressure distribution on the cross section of a Darrieus Rotor Blade (airfoil) was constructed. The model is based on the inviscid flow theory and the contribution of the nonsteady wake vortices was neglected. The analytical model was translated into a computer code to study a variety of boundary conditions encountered by the rotating blades of the Darrieus Rotor. It is indicated that, for a pitching airfoil, lift can be adequately approximated by the Kutta-Joukowski forces, despite notable deviations in the pressure distribution of the airfoil. These deviations are most significant at the upwind half of the Darrieus Rotor where higher life is accompanied by increased adverse pressure gradients. The effect of pitching on lift can be approximated by a linear shift in the angle of attack proportional to the blade angular velocity. Tabulation of the fluid velocity about the pitching only NACA 0015 allows the use of the principle of superposition to determine the fluid velocity about a translating and pitching airfoil. DOE

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-32364 Department of the Navy, Washington, D. C.
POSITION AND RESTRAINT SYSTEM FOR AIRCREWMAN Patent
M. Schwartz, inventor (to Navy) Issued 20 Mar. 1984 6 p Supersedes AD-D006748
(AD-D011058; US-Patent-4,437,628; US-Patent-Appl-SN-053465; US-Patent-Class-244-122) Avail: US Patent & Trademark Office CSCL 01/3

An aircraft ejection seat position and restraint system for protecting an aircrewman against back injuries during emergency escape. The ejection sequence is initiated by the aircrewman pulling a lower ejection handle or a face curtain handle with both hands to release or shatter the cockpit canopy. A torso harness suit is con-committantly tightened with inflation of a vest worn between the aircrewman and the suit, and catapult rockets are fired to propel the seat out of the cockpit. The harness suit draws the aircrewman's upper torso against the back of the seat while the inflated vest pushes his hips back and down into the set pan for optimally positioning his spine before ejection thereby negating the effects of an aircrewman purposely or inadvertently flying with a loose harness. After ejection, the seat is separated from the aircrewman but the vest remains inflated inside the harness providing cushioning against the opening shock force of the parachute which is attached to the harness suit. The inflatable vest is formed as a separate, one-piece garment which may be removed between flights. Author (GRA)

N84-32365*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIGHTNING SWEPT-STROKE ATTACHMENT PATTERNS AND FLIGHT CONDITIONS FOR STORM HAZARDS 1981
Bruce D. Fisher Aug. 1984 35 p
(NASA-TM-86279; NAS 1.15:86279) Avail: NTIS HC A03/MF A01 CSCL 01C

As part of the NASA Langley Research Center Storm Hazards Program, 111 thunderstorm penetrations were made in 1981 with an F-106B airplane in order to record direct-strike lightning data and the associated flight conditions. Ground-based weather radar measurements in conjunction with these penetrations were made by NOAA National Severe Storms Laboratory in Oklahoma and by NASA Wallops Flight Facility in Virginia. In 1981, the airplane received 10 direct lightning strikes; in addition, lightning transient data were recorded from 22 nearby flashes. Following each flight, the airplane was thoroughly inspected for evidence of lightning attachment, and the individual lightning attachment points were plotted on isometric projections of the airplane to identify swept-flash patterns. This report shows the strike attachment patterns that were found, and tabulates the flight conditions at the time of

each lightning event. Finally, this paper contains a table in which the data in this report are cross-referenced with the previously published electromagnetic waveform data recorded onboard the airplane. Author

N84-32366# Southwest Research Inst., San Antonio, Tex.
A RESEARCH STUDY OF THE ASSESSMENT OF ESCAPE IMPAIRMENT BY IRRITANT COMBUSTION GASES IN POST-CRASH AIRCRAFT FIRES Final Report
Harold L. Kaplan, Arthur F. Grand, Walter R. Rogers, Walter G. Switzer, and Gordon E. Hartzell Atlantic City FAA Sep. 1984 79 p refs
(Contract DTFA03-81-00065)
(FAA-CT-84-16; SwRI-01-6745) Avail: NTIS HC A05/MF A01

The primary objective of this research program was to assess the potential of representative combustion gases to impair human escape from a postcrash aircraft fire environment. A non-human primate model (juvenile savannah baboon) and an operant behavioral task were used to measure the individual effects of hydrogenchloride (HCL), carbonmonoxide (CO) and acrolein. A secondary objective was to evaluate the validity of laboratory tests with rodents to predict human escape impairment by combustion gases. For HCl, despite severe irritant effects, all baboons were able to perform the escape task over the range of concentrations studied (190 to 17,290 ppm). Significant post exposure effects were not observed at concentrations from 190 to 11,400 ppm; however, at the two highest concentrations, 16,570 and 17, 290 ppm, the animals died 18 and 76 days past exposure, respectively. For CO, it was determined that a concentration of 6850 ppm caused escape impairment of the baboon for a five-minute exposure. The results of CO exposure with the rate and the baboon were remarkably similar. Although less definitive, the data suggest that laboratory tests with rodents may have usefulness in predicting the effects of HCl atmospheres on human escape impairment. Author

N84-32367*# Simula, Inc., Tempe, Ariz.
DEVELOPMENT OF 2 UNDERSEAT ENERGY ABSORBERS FOR APPLICATION TO CRASHWORTHY PASSENGER SEATS FOR GENERAL AVIATION AIRCRAFT Final Report
James C. Warrick and S. P. Desjardins 18 Sep. 1979 93 p refs
(Contract NAS1-14583)
(NASA-CR-158927; NAS 1.26:158927) Avail: NTIS HC A05/MF A01 CSCL 01C

This report presents the methodology and results of a program conducted to develop two underseat energy absorber (E/A) concepts for application to nonadjustable crashworthy passenger seats for general aviation aircraft. One concept utilizes an inflated air bag, and the other, a convoluted sheet metal bellows. Prototypes of both were designed, built, and tested. Both concepts demonstrated the necessary features of an energy absorber (load-limiter); however, the air bag concept is particularly encouraging because of its light weight. Several seat frame concepts also were investigated as a means of resisting longitudinal and lateral loads and of guiding the primary vertical stroke of the underseat energy absorber. Further development of a seat system design using the underseat energy absorbers is recommended because they provide greatly enhanced crash survivability as compared with existing general aviation aircraft seats. Author

N84-32368# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORT. MIDAIR COLLISION: MCDONNELL-DOUGLAS F-4C BEECH D-55 BARON, CHERRY POINT, NORTH CAROLINA, 9 JANUARY 1983
19 Jun. 1983 38 p
(PB84-910407; NTSB-AAR-84-07) Avail: NTIS HC A03/MF A01 CSCL 01C

At 1644 eastern standard time, on January 9, 1983, a Beech D-55 Baron, N7142N, and a McDonnell-Douglas F-4C Phantom II, collided in flight at 9,300 feet about 30 miles south of Cherry Point, North Carolina. The twin engine Beech Baron was operating under visual flight rules from Nassau, the Bahamas, to Norfolk, Virginia, with a pilot and six passengers on board. The Baron crashed at sea and none of the occupants were recovered during the U.S. Coast Guard's search and rescue effort; all are presumed dead. The U.S. Air Force F-4C from the Michigan Air National Guard was operating a Special Military Instrument Intercept Clearance Mission from Seymour Johnson Air Force Base, Goldsboro, North Carolina. The purpose of the mission was to intercept an unknown target. The aircrew of the F-4C consisted of a pilot and a weapons systems officer seated in tandem. The F-4C sustained substantial damage to the left wing, and the left drop tank assembly separated. The F-4C flightcrew was not injured in the accident, and the airplane returned to Seymour Johnson Air Force Base without further incident. The Safety Board did not determine the probable cause of this accident. Author

N84-32369# Civil Aeronautics Board, Washington, D.C.
VOLUNTARY ACCOUNTING SYSTEMS FOR A SMALL AIR CARRIER: REVENUES, FINANCIAL AND TRAFFIC STATISTICS
1984 122 p refs
(PB84-210996) Avail: NTIS HC A06/MF A01 CSCL 05A

The Civil Aeronautics Board published a booklet to assist small airlines in setting up internal accounting procedures. The booklet shows small airlines not subject to CAB financial filing requirements how to set up their own internal systems. No mandatory reports are included in the booklet. The CAB is providing it to small airline companies as a service. The booklet describes methods of setting up balance sheets, profit and loss accounts, key statistical ratios for management analysis and evaluation, and methods to calculate various traffic statistics. GRA

N84-32370# Civil Aeronautics Board, Washington, D.C.
ECONOMIC CASES OF THE CIVIL AERONAUTICS BOARD, VOLUME 104, OCTOBER - NOVEMBER 1983
1983 530 p
(PB84-209287) Avail: NTIS HC A23/MF A01 CSCL 05C

A detailed description of economic cases reviewed by the Civil Aeronautics Board from October 1983 to November 1983 is given. The arguments presented by the contesting parties and the case rulings are included. GRA

N84-32371# General Accounting Office, Washington, D. C. Community and Economic Development Div.
LEGISLATION NEEDED TO CLARIFY FUTURE OF CONSUMER PROTECTION AND FEDERAL PREEMPTION AFTER THE CIVIL AERONAUTICS BOARD SUNSETS
13 Jun. 1984 41 p
(PB84-210103; GAO/RCED-84-154; B-213889) Avail: NTIS HC A03/MF A01 CSCL 05C

GAO reviewed the future of CAB's consumer protection functions and regulations upon CAB's sunset. The results of that work are summarized. GAO found that the act leaves uncertain the disposition of CAB's consumer protection functions and regulations as some functions will lapse and others may continue to exist but without an agency with authority to enforce them. Also, the act is unclear as to whether federal preemption, the prohibition which prevents states from regulating air carrier services, continues upon CAB's sunset. GAO believes that legislation is needed to clarify the disposition of CAB's consumer protection functions and regulations and the status of federal preemption. Legislation was passed in the House in early June 1984 which accomplishes these objectives. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-32372# Southern Methodist Univ., Dallas, Tex. Dept. of Electrical Engineering.

SENSOR NOISE AND KALMAN FILTER FOR AIDED INERTIAL NAVIGATION SYSTEM Final Report, 15 Mar. 1982 - 14 Mar. 1983
G. S. Grewal May 1984 20 p
(Grant AF-AFOSR-0006-82)
(AD-A143360; AFOSR-84-0556TR) Avail: NTIS HC A02/MF A01 CSCL 17/7

Inertial Navigation System, barometric altimeter, TACAN, and ILS are used to achieve a synergistic combination of the outputs of individual subsystems. Kalman filter is used to provide an ideal method for data processing in this multisensor navigation system. The filter design begins with the development of mathematical and statistical error models to describe the truth system. The truth model is simplified and reduced, in steps, to lower the computation burden on the on-board computer. The covariance analysis and the Monte Carlo methods of testing the performance of the Kalman filters based on reduced and simplified system models are discussed. Suggestions for further research in the area of fault detection and isolation are offered. Author (GRA)

N84-32373# Department of the Navy, Washington, D. C.
DIRECT MEASUREMENT OF EARTH'S VERTICAL DEFLECTION USING GLOBAL POSITIONING SYSTEM Patent Application
J. A. Calabria, J. DeMatteo, M. May, and P. E. Connolly, inventors (to Navy) Filed 30 Aug. 1982 22 p
(AD-D011099; US-Patent-Appl-SN-412466) Avail: NTIS HC A02/MF A01 CSCL 17/7

A shipboard system and associated technique are disclosed for measuring vertical deflection of the Earth along the track of a survey ship using navigational information obtained from the space-based Global Positioning System (GPS). Continuously coded signals emanating from a plurality of GPS orbiting satellites are received on board the ship and processed to produce real-time data indicative of the ship's vertical position and velocity. The data is recorded and through post-mission processing thereof, smoothed estimates of the ship's vertical position are obtained. The vertical position estimates, representative of the Earth's geoidal height along the course of the ship, are differentiated in accordance with a vertical deflection estimation algorithm, incorporating a Kalman smoothing filter, to obtain improved vertical deflection measurements along the track of the ship. Author (GRA)

N84-32374# Transportation Systems Center, Cambridge, Mass.
THUNDERSTORM IMPACT ON DENVER AIR TRAFFIC CONTROL OPERATIONS AND THE ROLE OF NEXRAD (NEXT GENERATION WEATHER RADAR) Final Report, May 1982 - Sep. 1983
L. E. Stevenson Apr. 1984 104 p refs Sponsored by DOT
(PB84-189729; DOT-TSC-RSPA-84-1) Avail: NTIS HC A06/MF A01 CSCL 17G

The impact of thunderstorms on the Denver Air Traffic Control (ATC) operation and the potential role of the Next Generation Weather Radar (NEXRAD) in reducing that impact was studied. The investigation was conducted in two stages. First, data collected at Denver during the summer of 1982 in collaboration with the JAWS Project was used to produce several one to two hour case studies. These case studies document specific thunderstorm impacted ATC situations in terms of traffic disruption, aircraft delay, and pilot reported encounters with turbulence, wind shear, microbursts, heavy rainfall and hail. Second, these case studies were used as a basis for follow up discussions with Denver ATC personnel. The result of the investigation is a qualitative and, where possible, quantitative description of the impact of thunderstorms on arrivals and departures at Stapleton International Airport. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-32375 Mississippi State Univ., State College.
AN INVESTIGATION OF A NEW FLIGHT TEST METHOD FOR MEASURING THE PERFORMANCE OF GENERAL AVIATION AIRCRAFT Ph.D. Thesis
Philip Dean Bridges 1983 70 p
Avail: Univ. Microfilms Order No. DA8410661

A new procedure for using level flight accelerations and decelerations of propeller-driven general aviation aircraft to measure propulsive efficiency and aircraft drag is investigated. An approximate closed-form solution for the velocity change as a function of time is found, and the influence of the system time constant on aircraft disturbances is discussed. The maneuver is then executed on a six degree-of-freedom computer simulation to provide simulated flight test data. Two estimation procedures, maximum likelihood and extended Kalman filtering, are used to extract the propulsive efficiency and aircraft drag from the simulation data. Various levels of measurement noise and bias are investigated, and their effects on the estimates are discussed. It is found that the maximum likelihood estimator is preferred because of faster convergence and the ability of combine multiple runs. The method is then applied to actual flight test data. Dissert. Abstr.

N84-32376 Department of the Air Force, Washington, D.C.
METHOD OF MAKING COMPARTMENTED, FILAMENT WOUND, ONE-PIECE AIRCRAFT FUEL TANKS Patent
E. J. Morrisey, inventor (to Air Force) Issued 12 Jun. 1984 6 p Supersedes AD-D009351
(AD-D011144; US-Patent-4,453,995; US-Patent-Appl-SN-339258; US-Patent-Class-156-172) Avail: US Patent & Trademark Office CSCL 13/4

An external aircraft fuel tank is provided which comprises a filament-reinforced fuel cell assembled with aerodynamic end shapes having a plurality of layers of adhesive resin-impregnated filament wrappings over the assembly. Also provided is a method for making the fuel tank. Author (GRA)

N84-32377*# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
DESIGN OF A COMPOSITE WING EXTENSION FOR A GENERAL AVIATION AIRCRAFT Final Report
Pamela S. Adney and Walter J. Horn Sep. 1984 49 p refs
(Grant NAG1-184)
(NASA-CR-173832; NAS 1.26:173832) Avail: NTIS HC A03/MF A01 CSCL 01C

A composite wing extension was designed for a typical general aviation aircraft to improve lift curve slope, dihedral effect, and lift to drag ratio. Advanced composite materials were used in the design to evaluate their use as primary structural components in general aviation aircraft. Extensive wind tunnel tests were used to evaluate six extension shapes. The extension shape chosen as the best choice was 28 inches long with a total area of 17 square feet. Subsequent flight tests showed the wing extension's predicted aerodynamic improvements to be correct. The structural design of the wing extension consisted of a hybrid laminate carbon core with outer layers of Kevlar - layed up over a foam interior which acted as an internal support. The laminate skin of the wing extension was designed from strength requirements, and the foam core was included to prevent buckling. A joint lap was recommended to attach the wing extension to the main wing structure. Author

N84-32378*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VALIDATION OF AN ACTIVE GEAR, FLEXIBLE AIRCRAFT

TAKE-OFF AND LANDING ANALYSIS (AGFATL)
John R. McGehee Sep. 1984 31 p refs
(NASA-TP-2353; L-15807; NAS 1.60:2353) Avail: NTIS HC A03/MF A01 CSCL 01C

The results of an analytical investigation using a computer program for active gear, flexible aircraft take off and landing analysis (AGFATL) are compared with experimental data from shaker tests, drop tests, and simulated landing tests to validate the AGFATL computer program. Comparison of experimental and analytical responses for both passive and active gears indicates good agreement for shaker tests and drop tests. For the simulated landing tests, the passive and active gears were influenced by large strut binding friction forces. The inclusion of these undefined forces in the analytical simulations was difficult, and consequently only fair to good agreement was obtained. An assessment of the results from the investigation indicates that the AGFATL computer program is a valid tool for the study and initial design of series hydraulic active control landing gear systems.
Author

N84-32379*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPUTER STUDIES OF HYBRID-SLOTTED WORKING SECTIONS WITH MINIMUM INTERFERENCE AT SUBSONIC SPEEDS
Frank W. Steinle, Jr. and Dennis G. Mabey Aug. 1984 20 p refs
(NASA-TM-86002; A-9845; NAS 1.15:86002) Avail: NTIS HC A02/MF A01 CSCL 01C

A series of computations on tunnel boundary-interference effects for hybrid-slotted working sections was performed using the WALINT code. The slots were modeled as lines of porosity with linear crossflow characteristics. The basic shape evaluated was for a rectangular section with height-to-width ratio = 0.835 and its companion in the duplex mode (half model testing) with height-to-width ratio = 0.6. A best overall basic configuration was determined with seven slots on each wall with open area ratio on each wall of 17.5%. For both full-span and half-model testing, the optimum solution required closing all but two slots on each of the half-walls parallel to the plane of the wing (equivalent to four slots on the full floor and ceiling). The results are presented here for the best configurations and are shown to be within the figure-of-merit range of + or - 0.04 in upwash, and + or - 0.1 in curvature for the Mach number range 0.6 to 0.85. Blockage effects are shown to be small.
Author

N84-32380*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A MATHEMATICAL SIMULATION MODEL OF THE CH-46B HELICOPTER, VOLUME 2
Jeanine M. Weber, Tung Y. Liu (Computer Sciences Corp., Mountain View, Calif.), and William Chung (Computer Sciences Corp., Mountain View, Calif.) Aug. 1984 164 p refs 2 Vol.
(NASA-TM-84351; A-9303; NAS 1.15:84351) Avail: NTIS HC A08/MF A01 CSCL 01C

A nonlinear simulation model of the CH-47B helicopter, was adapted for use in a simulation facility. The model represents the specific configuration of the variable stability CH-47B helicopter. Modeling of the helicopter uses a total force approach in six rigid body degrees of freedom. Rotor dynamics are simulated using the Wheatley-Bailey equations, steady state flapping dynamics and included in the model of the option for simulation of external suspension, slung load equations of motion. Validation of the model was accomplished by static and dynamic data from the original Boeing Vertol mathematical model and flight test data. The model is appropriate for use in real time piloted simulation and is implemented on the ARC Sigma IX computer where it may be operated with a digital cycle time of 0.03 sec.
E.A.K.

N84-32381*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA ROTOR SYSTEM RESEARCH AIRCRAFT FLIGHT-TEST DATA REPORT: HELICOPTER AND COMPOUND CONFIGURATION
R. E. Erickson, R. M. Kufeld, J. L. Cross, R. W. Hodge (Sikorsky Aircraft Co., Stratford, Conn.), W. F. Ericson (Sikorsky Aircraft Co., Stratford, Conn.), and R. D. G. Carter (Sikorsky Aircraft Co., Stratford, Conn.) Aug. 1984 244 p refs
(NASA-TM-85843; NAS 1.15:85843) Avail: NTIS HC A11/MF A01 CSCL 01C

The flight test activities of the Rotor System Research Aircraft (RSRA), NASA 740, from June 30, 1981 to August 5, 1982 are reported. Tests were conducted in both the helicopter and compound configurations. Compound tests reconfirmed the Sikorsky flight envelope except that main rotor blade bending loads reached endurance at a speed about 10 knots lower than previously. Wing incidence changes were made from 0 to 10 deg.
Author

N84-32382# Naval War Coll., Newport, R. I.
THE FEASIBILITY, PRACTICALITY AND UTILITY OF P-3 INFLIGHT REFUELING
D. J. Brennock 22 Jun. 1984 47 p
(AD-A143419) Avail: NTIS HC A03/MF A01 CSCL 01/2

The U.S. Navy's primary long-range maritime patrol aircraft no longer possesses the necessary range and time on station to fulfill its missions of antisubmarine warfare, anti-surface warfare, open ocean surveillance and intelligence collection. The capability to refuel the P-3 inflight would allow coverage of key ocean areas of vital interest in wartime as well as peacetime, but are not presently and in the future may not be accessible. Constraints placed upon this study include the lack of actual flights involving the transfer of fuel, but detailed analysis of accurately predicted performance data suffices. Questionable political stability of some friendly nations was assumed in the final analysis to be unfavorable in respect to forward basing facilities. This paper does not address the financial aspect of the necessary modifications but emphasizes its feasibility, practicality, and applicability. Inflight refueling would enable the P-3 to extend its range and remain on station for sufficient duration, so as to provide the necessary coverage of vital areas of the Indian Ocean, Atlantic Ocean, and Greenland and Barents Seas, recognizing that all present deployment areas are not restricted by fuel limitations. The author recommends that an appropriate number of squadrons be retrofitted to provide an inflight refueling capability.
GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-32383*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRCRAFT LIFTMETER Patent Application
Ernest W. Millen, inventor (to NASA) Filed 8 Feb. 1984 15 p
(NASA-Case-LAR-12518-1; NAS 1.71:LAR-12518-1; US-Patent-Appl-SN-578388) Avail: NTIS HC A02/MF A01 CSCL 01D

A display for aiding the pilot of an aircraft in anomalous wind environments is described. Wind velocity components are measured by an instrument, processed by a computer and a vector generator and then displayed as a vector. The display utilizes the measurements of ground speed and of wind velocity in three mutually perpendicular directions. This display will also show changes in lift of an aircraft.
B.W.

N84-32384*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIR DATA POSITION-ERROR CALIBRATION USING STATE RECONSTRUCTION TECHNIQUES Final Report
Stephen A. Whitmore, Terry J. Larson, and L. J. Ehernberger Sep. 1984 31 p refs

(NASA-TM-86029; H-1217; NAS 1.15:86029) Avail: NTIS HC A03/MF A01 CSCL 01D

During the highly maneuverable aircraft technology (HiMAT) flight test program recently completed at NASA Ames Research Center's Dryden Flight Research Facility, numerous problems were experienced in airspeed calibration. This necessitated the use of state reconstruction techniques to arrive at a position-error calibration. For the HiMAT aircraft, most of the calibration effort was expended on flights in which the air data pressure transducers were not performing accurately. Following discovery of this problem, the air data transducers of both aircraft were wrapped in heater blankets to correct the problem. Additional calibration flights were performed, and from the resulting data a satisfactory position-error calibration was obtained. This calibration and data obtained before installation of the heater blankets were used to develop an alternate calibration method. The alternate approach took advantage of high-quality inertial data that was readily available. A linearized Kalman filter (LKF) was used to reconstruct the aircraft's wind-relative trajectory; the trajectory was then used to separate transducer measurement errors from the aircraft position error. This calibration method is accurate and inexpensive. The LKF technique has an inherent advantage of requiring that no flight maneuvers be specially designed for airspeed calibrations. It is of particular use when the measurements of the wind-relative quantities are suspected to have transducer-related errors. Author

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-32385 Georgia State Univ., Atlanta.
A STUDY OF HEAT RELEASE RATE DISTRIBUTION IN A GAS TURBINE COMBUSTOR BY ACOUSTIC MEASUREMENTS Ph.D. Thesis
Yei-Chin Chao 1984 145 p refs
Avail: Univ. Microfilms Order No. DA8411312

Use of the acoustic techniques for detecting the heat release rate fluctuation distribution in a gas turbine combustor is carefully studied on modified combustor burning propane. A pulse method is developed to measure the axial speed of sound distribution in the combustor. A cross section averaging ionization probe is used to measure the heat release rate distribution for verification of the computational results. Sound speed data together with in-field combustion noise spectra are used to obtain the heat release rate spectral information by solving a difficult inverse problem. The inverse problem is unstable and extremely sensitive to experimental errors. Application of an implicit least-square-fit method to include the boundary conditions in the solution of the problem failed to yield convergent results after trying several iteration methods. Dissert. Abstr.

N84-32386 Department of the Air Force, Washington, D.C.
AXISYMMETRIC THRUST AUGMENTING EJECTOR WITH DISCRETE PRIMARY AIR SLOT NOZZLES Patent
S. G. Reznick and M. E. Franke, inventors (to Air Force) Issued 15 May 1984 5 p Supersedes AD-D009765
(AD-D011129; US-Patent-4,448,354; US-Patent-Appl-SN-401163; US-Patent-Class-239-265.17) Avail: US Patent & Trademark Office CSCL 21/5

A circular thrust augmenting ejector has an annular wall which defines a central passageway and a convergent contoured inlet section, a constant area cylindrical mixing section and a divergent conical diffuser outlet section. The inlet, mixing and outlet sections merge one into the next in axisymmetric serial relationship. The ejector also has a plurality of discrete primary nozzles arrange about the periphery of the annular wall at the entrance to the inlet section thereof for injecting a primary flow of high velocity air into the inlet section and thereby entraining a secondary flow of ambient air into the central passageway of the ejector. Author (GRA)

N84-32387*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
JT15D SIMULATED FLIGHT DATA EVALUATION Final Report
R. G. Holm Sep. 1984 217 p refs
(NASA-CR-172322; NAS 1.26:172322) Avail: NTIS HC A10/MF A01 CSCL 21E

The noise characteristics of the JT15D turbofan engine was analyzed with the objectives of: (1) assessing the state-of-art ability to simulate flight acoustic data using test results acquired in wind tunnel and outdoor (turbulence controlled) environments; and (2) predicting the farfield noise directivity of the blade passage frequency (BPF) tonal components using results from rotor blade mounted dynamic pressure instrumentation. Engine rotor tip speeds at subsonic, transonic, and supersonic conditions were evaluated. The ability to simulate flight results was generally within 2-3 dB for both outdoor and wind tunnel acoustic results. Some differences did occur in the broadband noise level and in the multiple-pure-tone harmonics at supersonic tip speeds. The prediction of blade passage frequency tone directivity from dynamic pressure measurements was accomplished for the three tip speed conditions. Predictions were made of the random and periodic components of the tone directivity. The technique for estimating the random tone component used hot wire data to establish a correlation between dynamic pressure and turbulence intensity. This prediction overestimated the tone level by typically 10 dB with the greatest overestimates occurring at supersonic conditions. B.W.

N84-32388*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF STATOR ENDWALL COUNTOURING IN A SMALL AXIAL-FLOW TURBINE
Jeffrey E. Haas and Robert J. Boyle Sep. 1984 23 p refs Prepared in cooperation with Army Research and Technology Labs., Cleveland
(NASA-TP-2309; E-2050; NAS 1.60:2309; AVSCOM-TR-84-C-5) Avail: NTIS HC A02/MF A01 CSCL 21E

An experimental and analytical investigation was conducted to determine the effect of stator endwall contouring on turbine stage performance. In this investigation three stator configurations were evaluated using a common rotor. The three stator configurations were a cylindrical endwall design and two contoured endwall designs, one having a S-shaped outer wall profile and the other having a conical-shaped outer wall profile. Experimental data were obtained over a range of equivalent speeds, total pressure ratios, and rotor tip clearances for each stator-rotor combination. Detailed analytical loss assessments were conducted to aid in the determination of the contouring effect on turbine performance. Author

N84-32389*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
ENERGY EFFICIENT ENGINE COMPONENT DEVELOPMENT AND INTEGRATION PROGRAM Semiannual Status Report, 1 Apr. - 30 Sep. 1980
19 Dec. 1980 392 p
(Contract NAS3-20646)
(NASA-CR-173884; NAS 1.26:173884; SASR-5; PWA-5594-142) Avail: NTIS HC A17/MF A01 CSCL 21E

The design of an energy efficient commercial turbofan engine is examined with emphasis on lower fuel consumption and operating costs. Propulsion system performance, emission standards, and noise reduction are also investigated. A detailed design analysis of the engine/aircraft configuration, engine components, and core engine is presented along with an evaluation of the technology and testing involved. M.A.C.

N84-32390*# Pennsylvania State Univ., University Park.
A THEORETICAL AND EXPERIMENTAL STUDY OF TURBULENT EVAPORATING SPRAYS Final Report
A. S. P. Solomon, J-S. Shuen, Q-F. Zhang, and G. M. Faeth Sep. 1984 138 p refs
(Grant NAG3-190)
(NASA-CR-174760; NAS 1.26:174760) Avail: NTIS HC A07/MF A01 CSCL 21E

Measurements and analysis limited to the dilute portions of turbulent evaporating sprays, injected into a still air environment were completed. Mean and fluctuating velocities and Reynolds stress were measured in the continuous phase. Liquid phase measurements included liquid mass fluxes, drop sizes and drop size and velocity correlation. Initial conditions needed for model evaluation were measured at a location as close to the injector exit as possible. The test sprays showed significant effects of slip and turbulent dispersion of the discrete phase. The measurements were used to evaluate three typical models of these processes: (1) a locally homogeneous flow (LHF) model, where slip between the phases were neglected; (2) a deterministic separated flow (DSF) model, where slip was considered but effects of drop dispersion by turbulence were ignored; and (3) a stochastic separated flow (SSF) model, where effects of interphase slip and turbulent dispersion were considered using random-walk computations for drop motion. For all three models, a k-epsilon model as used to find the properties of the continuous phase. The LHF and DSF models did not provide very satisfactory predictions for the present measurements. In contrast, the SSF model performed reasonably well--with no modifications in the prescription of eddy properties from its original calibration. B.W.

N84-32391# Department of the Navy, Washington, D. C.
PIN ROOTED BLADE BIAXIAL AIR SEAL Patent Application
Adams, inventor (to Navy) Filed 18 May 1984 7 p
(AD-D011086; US-Patent-Appl-SN-611652) Avail: NTIS HC A02/MF A01 CSCL 11/1

In an axial flow compressor rotor stage, having a blade mount rail about the periphery thereof, a seal is positioned below the blade platforms to provide improved compressor gas path efficiency. Each blade platform has a seal bonded to the underside thereof, said seals extending toward adjacent blade platforms and providing sealing means in the interstices between said platforms as well as between said platforms and said blade mount rail.
Author (GRA)

N84-32392# Department of the Air Force, Washington, D.C.
THRUST REVERSER/EXHAUST NOZZLE ASSEMBLY FOR A GAS TURBINE ENGINE Patent Application
E. B. Thayer, inventor (to Air Force) Filed 16 May 1984 16 p
(AD-D011101; US-Patent-Appl-SN-611041) Avail: NTIS HC A02/MF A01 CSCL 21/5

An improved thrust reverser/exhaust nozzle assembly has a plurality of blocker devices located in the divergent section of the exhaust nozzle and plurality of deflector devices located in the convergent section of of the nozzle. The blocker and deflector devices are linked together such that they move simultaneously and maintain a substantially constant engine flowrate during transitions of the engine between forward and reverse thrust conditions. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-32393*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FLIGHT-TEST AND SIMULATION EVALUATION OF THE LONGITUDINAL FINAL APPROACH AND LANDING PERFORMANCE OF AN AUTOMATIC SYSTEM FOR A LIGHT WING LOADING STOL AIRCRAFT EQUIPPED WITH WING SPOILERS
Stuart C. Brown, Gordon H. Hardy, and William S. Hindson Sep. 1984 46 p refs
(NASA-TM-85873; A-9222; NAS 1.15:85873) Avail: NTIS HC A03/MF A01 CSCL 01C

As part of a comprehensive flight-test investigation of short takeoff and landing (STOL) operating systems for the terminal systems for the terminal area, an automatic landing system has been developed and evaluated for a light wing-loading turboprop-powered aircraft. An advanced digital avionics system performed display, navigation, guidance, and control functions for the test aircraft. Control signals were generated in order to command powered actuators for all conventional controls and for a set of symmetrically driven wing spoilers. This report describes effects of the spoiler control on longitudinal autoland (automatic landing) performance. Flight-test results, with and without spoiler control, are presented and compared with available (basically, conventional takeoff and landing) performance criteria. These comparisons are augmented by results from a comprehensive simulation of the controlled aircraft that included representations of the microwave landing system navigation errors that were encountered in flight as well as expected variations in atmospheric turbulence and wind shear. Flight-test results show that the addition of spoiler control improves the touchdown performance of the automatic landing system. Spoilers improve longitudinal touchdown and landing pitch-attitude performance, particularly in tailwind conditions. Furthermore, simulation results indicate that performance would probably be satisfactory for a wider range of atmospheric disturbances than those encountered in flight. Flight results also indicate that the addition of spoiler control during the final approach does not result in any measurable change in glidepath track performance, and results in a very small deterioration in airspeed tracking. This difference contrasts with simulations results, which indicate some improvement in glidepath tracking and no appreciable change in airspeed tracking. The modeling problem in the simulation that contributed to this discrepancy with flight was not resolved. Author

N84-32394*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MINIMUM-FUEL, 3-DIMENSIONAL FLIGHTPATH GUIDANCE OF TRANSFER JETS
F. Neuman and E. Kreindler (Technion Israel Inst. of Tech., Haifa) Sep. 1984 90 p refs
(NASA-TP-2326; A-9533; NAS 1.60:2326) Avail: NTIS HC A05/MF A01 CSCL 01C

Minimum fuel, three dimensional flightpaths for commercial jet aircraft are discussed. The theoretical development is divided into two sections. In both sections, the necessary conditions of optimal control, including singular arcs and state constraints, are used. One section treats the initial and final portions (below 10,000 ft) of long optimal flightpaths. Here all possible paths can be derived by generating fields of extremals. Another section treats the complete intermediate length, three dimensional terminal area flightpaths. Here only representative sample flightpaths can be computed. Sufficient detail is provided to give the student of optimal control a complex example of a useful application of optimal control theory. R.J.F.

N84-32395*# Lockheed-California Co., Burbank.
DEVELOPMENT AND FLIGHT EVALUATION OF AN AUGMENTED STABILITY ACTIVE CONTROLS CONCEPT WITH A SMALL TAIL
9 Oct. 1980 96 p
(Contract NAS1-15326)
(NASA-CR-173880; NAS 1.26:173880; LR-29619) Avail: NTIS HC A05/MF A01 CSCL 01C

Parasite drag reduction evaluation is composed of wind tunnel tests with a standard L-1011 tail and two reduced area tail configurations. Trim drag reduction is evaluated by rebalancing the airplane for relaxed static stability. This is accomplished by pumping water to tanks in the forward and aft of the airplane to acheive desired center of gravity location. Also, the L-1011 is modified to incorporate term and advanced augmented systems.

By using advanced wings and aircraft relaxed static stability significant fuel savings can be realized. An airplane's dynamic stability becomes more sensitive for decreased tail size, relaxed static stability, and advanced wing configurations. Active control pitch augmentation will be used to acheive the required handling qualities. Flight tests will be performed to evaluate the pitch augmentation systems. The effect of elevator downrig on stabilizer/elevator hinge moments will be measured. For control system analysis, the normal acceleration feedback and pitch rate feedback are analyzed. S.B.

N84-32396# Vought Corp., Dallas, Tex.
LOW TEMPERATURE EVALUATION OF ADVANCED TECHNOLOGY HYDRAULIC SYSTEM (8,000 PSI) Final Report, Sep. 1982 - Apr. 1983
R. B. Olsen Warminster, Pa. Naval Air Development Center Aug. 1983 37 p
(Contract N62269-82-C-0362)
(AD-A143389; NADC-82132-60) Avail: NTIS HC A03/MF A01 CSCL 01/3

Tests were conducted at temperatures from - 40 F to + 120 F on two simulated aircraft flight control hydraulic circuits. One of the circuits used an A-7 aileron flight control actuator designed for 3000 psi operating pressure with 3/8 and 1/4 inch diameter tubing. The other circuit used an actuator designed for 8000 psi operation with 1/4 and 3/16 inch diameter tubing. Both actuators were designed for the same frequency response, rate and thrust requirements. MIL-H-83282 fluid was used for all tests. Frequency response and zero load rate tests at varying temperatures on the two circuits established the minimum temperatures at which performance requirements were met. Time versus temperature data from A-7D Category II Tests was used in heat transfer calculations to provide a comparison of warm up times for aircraft systems using 3000 or 8000 psi. Results of all tests and analysis indicate that there is no essential difference in warm up time for systems operating at 3000 or 8000 psi. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-32397*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
ENGINEERING CHANGES TO THE 0.1m CRYOGENIC WIND TUNNEL AT SOUTHAMPTON UNIVERSITY
M. J. Goodyear Aug. 1984 21 p refs Sponsored in part by Kentron International, Inc.
(Contract NAS1-16000)
(NASA-CR-172430; NAS 1.26:172430) Avail: NTIS HC A02/MF A01 CSCL 14B

The more important changes to the 0.1 m cryogenic wind tunnel since its completion in 1977 are outlined. These include detailed improvements in the fan drive to allow higher speeds, and the provision of a test section leg suitable for use with a magnetic suspension and balance system. The instrumentation, data logging, data reduction and tunnel controls were also improved and modernized. A tunnel performance summary is given. Author

N84-32398*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WARM FOG DISSIPATION USING LARGE VOLUME WATER SPRAYS Patent Application
Vernon W. Keller, inventor (to NASA) Filed 23 Jul. 1984 17 p
(NASA-Case-MFS-25962-1; NAS 1.71:MFS-25962-1;
US-Patent-Appl-SN-633180) Avail: NTIS HC A02/MF A01 CSCL 01E

This research relates to warm fog dissipation by using large volume water sprays, and to water spray systems for spraying large quantities of water in a specific area to eliminate warm fogs. To accomplish the removal of warm fog about an area such as an airport runway, a plurality of nozzles along a line adjacent the area propells water jets through the fog to heights of approximately twenty-five meters. Each water jet breaks up forming a water drop size distribution that falls through the fog overtaking, colliding, and coalescing with individual fog droplets and thereby removes the fog. A water retrieval system is used to collect the water and return it to reservoirs for pumping it to the nozzles once again. NASA

N84-32399*# Stanford Univ., Calif.
STUDIES IN A TRANSONIC ROTOR AERODYNAMICS AND NOISE FACILITY
S. E. Wright, D. J. Lee, and W. Crosby Aug. 1984 22 p refs
(Contract NCC2-89)
(NASA-CR-166588; NAS 1.26:166588) Avail: NTIS HC A02/MF A01 CSCL 14B

The design, construction and testing of a transonic rotor aerodynamics and noise facility was undertaken, using a rotating arm blade element support technique. This approach provides a research capability intermediate between that of a stationary element in a moving flow and that of a complete rotating blade system, and permits the acoustic properties of blade tip elements to be studied in isolation. This approach is an inexpensive means of obtaining data at high subsonic and transonic tip speeds on the effect of variations in tip geometry. The facility may be suitable for research on broad band noise and discrete noise in addition to high-speed noise. Initial tests were conducted over the Mach number range 0.3 to 0.93 and confirmed the adequacy of the acoustic treatment used in the facility to avoid reflection from the enclosure. R.J.F.

N84-32400# Federal Aviation Agency, Atlantic City, N.J.
MODIFIED REFLEX-PERCUSSIVE GROOVES FOR RUNWAYS Final Report
S. K. Agrawal Apr. 1984 25 p
(AD-A143569; DOT/FAA/CT-84/7; DOT/FAA/PM-84/8) Avail: NTIS HC A02/MF A01 CSCL 01/5

Runway surface treatments, such as grooves, can minimize the danger of aircraft hydroplanning by reducing the water buildup on the runway and by facilitating forced water escape from tire-runway interface. Square saw-cut grooves of 1/4-inch size with spacing between 1 inch and 2 1/2 inches have been widely used, the former providing a higher resistance to hydroplanning. Other surface treatments that have been reported as being effective in minimizing aircraft hydroplanning include porous friction overlay and reflex-percussive grooves. The latter being offered as a cost-effective alternative to square saw-cut grooves. As the title of this report suggests, the modified reflex-percussive grooves are a derivative of reflex-percussive grooves; the cutting heads for the latter were modified to produce smoother groove edges which tend to improve water flow through the groove channels. Comparative dynamic tests showed that the braking performance of an aircraft tire on modified reflex-percussive grooves is equivalent to the performance on square saw-cut grooves spaced between 1 1/4 inches and 2 inches. Results also showed that hydroplanning was not initiated up to 150 knots speed. The lower cost of the modified grooves makes them a viable cost-competitive method; however, realistic cost estimates and full-savings potential can only be affirmed after application of these grooves in an operational environment. GRA

N84-32401# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Flight Mechanics Panel.
FUTURE REQUIREMENTS FOR AIRBORNE SIMULATION
J. Buhrman (National Aerospace Lab.) Apr. 1984 17 p refs
(AGARD-AR-188; ISBN-92-835-1471-8) Avail: NTIS HC A02/MF A01

Airborne and ground-based flight simulation are complementary

techniques widely used in aeronautical research and development. The rapid advances in recent years both in the level of sophistication and in the degree of attainable fidelity for modern ground-based flight simulation systems has, however, called into question the future role of in-flight simulators in the research and development processes. The premise that this role may soon disappear has been addressed by a Subcommittee of the AGARD Flight Mechanics Panel. General purpose airborne simulators and special purpose research aircraft will continue to serve a useful complementary role to the ground-based simulator through the next generation of aircraft development programs. Author

N84-32402# National Aerospace Lab., Amsterdam (Netherlands). Compressible Aerodynamics Dept.
TECHNICAL EVALUATION REPORT ON THE FLUID DYNAMICS PANEL SYMPOSIUM ON WIND TUNNELS AND TESTING TECHNIQUES
A. Elsenaar May 1984 13 p refs Symp. held in Cesme, Turkey, 26-29 Sep. 1983
(AGARD-AR-193; ISBN-92-835-1473-4) Avail: NTIS HC A02/MF A01 CSCL 14B

Testing techniques and wind tunnels were discussed. New facilities and their performance, design, wind tunnel tests like scale effects and disturbance effect were reported. New developments in cryogenic testing techniques, and refinement of conventional techniques, instrumentation, model design and construction are reported. The increasing impact of computer development on wind tunnel testing is addressed. E.A.K.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-32403*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TELECOMMUNICATIONS AND DATA ACQUISITION SUPPORT FOR THE PIONEER VENUS PROJECT: PIONEERS 12 AND 13, PRELAUNCH THROUGH MARCH 1984 Final Report
R. B. Miller, R. E. Ryan, N. A. Renzetti, and M. R. Traxler 1 Jul. 1984 70 p refs
(NASA-CR-173893; JPL-Pub-84-43; NAS 1.26:173893) Avail: NTIS HC A04/MF A01 CSCL 22A

The support provided by the Telecommunications and Data Acquisition organization of the Jet Propulsion Laboratory (JPL) to the Pioneer Venus missions is described. The missions were the responsibility of the Ames Research Center (ARC). The Pioneer 13 mission and its spacecraft design presented one of the greatest challenges to the Deep Space Network (DSN) in the implementation and operation of new capabilities. The four probes that were to enter the atmosphere of Venus were turned on shortly before arrival at Venus, and the DSN had to acquire each of these probes in order to recover the telemetry being transmitted. Furthermore, a science experiment involving these probes descending through the atmosphere required a completed new data type to be generated at the ground stations. This new data type is known as the differential very long baseline interferometry. Discussions between ARC and JPL of the implementation requirements involved trade-offs in spacecraft design and led to a very successful return of science data. Specific implementation and operational techniques are discussed, not only for the prime mission, but also for the extended support to the Pioneer 12 spacecraft (in orbit around Venus) with its science instruments including that for radar observations of the planet. Author

N84-32404*# Computer Sciences Corp., Silver Spring, Md.
SOFTWARE CONVERSION HISTORY OF THE FLIGHT DYNAMICS SYSTEM (FDS)
K. Liu Jun. 1984 176 p
(Contract NAS5-27888)
(NASA-CR-175257; NAS 1.26:175257; CSC/TM-84/6059) Avail: NTIS HC A09/MF A01 CSCL 22A

This report summarizes the overall history of the Flight Dynamics System (FDS) applications software conversion project. It describes the background and nature of the project; traces the actual course of conversion; assesses the process, product, and personnel involved; and offers suggestions for future projects. It also contains lists of pertinent reference material and examples of supporting data. Author

N84-32405*# Computer Sciences Corp., Silver Spring, Md.
FLIGHT EXPERIMENT DEMONSTRATION SYSTEM (FEDS): MATHEMATICAL SPECIFICATION
Dwight E. Shank Jul. 1984 96 p refs
(Contract NAS5-27888)
(NASA-CR-175252; NAS 1.26:175252; CSC/TM-84-6083) Avail: NTIS HC A05/MF A01 CSCL 22A

Computational models for the flight experiment demonstration system (FEDS) code 580 were developed. The FEDS is a modification of the automated orbit determination system which was developed during 1981 and 1982. The purpose of FEDS is to demonstrate, in a simulated spacecraft environment, the feasibility of using microprocessors to perform onboard orbit determination with limited ground support. E.A.K.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-32406*# Iowa Univ., Iowa City.
GEOMETRICAL RELATIONSHIPS OF PIONEER 11 TO URANUS AND VOYAGER 2 IN 1985-86 Progress Report
J. A. VanAllen Jun. 1984 22 p
(Contracts NAS2-11125; N00014-76-C-0016)
(NASA-CR-173675; NAS 1.26:173675; AD-A143330; U-OF-IOWA-84-14) Avail: NTIS HC A02/MF A01 CSCL 22B

The geometrical relationships of Pioneer 11 to Uranus and Voyager 2 during 1985-86 are summarized, with special attention to conditions during Voyager 2's encounter with Uranus on 24 January 1986. It is shown that Pioneer 11 will be able to provide valuable observations of the solar wind, the magnetic field, and energetic particle intensity in the nearby interplanetary medium before, during, and after that encounter. All of these quantities are significant in determining the state of Uranus' magnetosphere and fluctuations thereof. Author (GRA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-32407# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A DESCRIPTION OF THE GROUND SEGMENT OF CNES, ESA, AND TELESAT [DESCRICAO DOS SEGMENTOS SOLO DO CNES, DA ESA E DA TELESAT]
Etiene Monteiro Schneider Dec. 1983 30 p refs In PORTUGUESE; ENGLISH summary
(INPE-2984-NTE/211) Avail: NTIS HC A03/MF A01

The ground segment for satellite launching and operation support is one of the most important parts of this type of space activity, not only due to its cost and size but also to its life that, in general, is many years longer than the satellite itself. These are the reasons for considering the experience of those who have already constructed such a segment when one starts designing.

A brief description with the data available at the moment, on the ground segment of CNES, ESA and TELESAT is presented.
Author

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-32408# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data, and Information Service.
SATELLITE ACTIVITIES OF NOAA, 1983
Jul. 1984 22 p
Avail: NTIS HC A02/MF A01

Some services and uses, both national and international, are given. Satellite data are used to assess the impact of natural factors and human activities on global food and fuel supplies and on environmental quality. The data also are used to observe and forecast weather conditions, issue warnings of severe weather, and assist community preparedness programs for weather related disasters; to prepare charts and coastal maps and for geodetic research; to improve assessment and conservation of marine life; to meet the needs of public and private users, including scientists; and for research to improve the nation's environmental service. NOAA agencies that participate directly in aeronautics and space programs are: the National Environmental Satellite, Data and Information Service, the National Weather Service, the National Ocean Service, the National Marine Fisheries Service, and the Office of Oceanic and Atmospheric Research. E.R.

N84-32409# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON OF ANALYTICAL THEORIES FOR STUDYING THE CONTRACTION OF ARTIFICIAL SATELLITE ORBITS [COMPARACAO ENTRE TEORIAS ANALITICAS PARA O ESTUDO DE CONTRACAO DE ORBITAS DE SATELITES ARTIFICIAIS]
Maureen Teresa Rose Fitzgibbon, Rodolpho Vilhena deMoaes, and Diomar Cesar Lobao May 1983 12 p refs IN PORTUGUESE; ENGLISH summary Presented at the 7th Congr. Brasileiro de Engenharia Mec., Uberlandia, Brazil, 13-16 Dec. 1983
(INPE-2746-PRE/322) Avail: NTIS HC A02/MF A01

An analytical solution of the noncanonical system of differential equations governing the motion of an artificial Earth satellite disturbed by the effects of air drag and geopotential is proposed, based on the method of variation of parameters. This solution is compared with the classical one proposed by Brouwer and Hori in 1961 for the same problem. Numerical results for a balloon type satellite are presented. Author

N84-32410*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
A STUDY OF LEESIDE FLOW FIELD HEAT TRANSFER ON SHUTTLE ORBITER CONFIGURATION Final Report
Leroy C. Baranowski and H. W. Kipp Hampton, Va. NASA. Langley Research Center Aug. 1984 316 p refs
(Contract NAS1-16839)
(NASA-CR-172362; NAS 1.26:172362) Avail: NTIS HC A14/MF A01 CSCL 20D

A coupled inviscid and viscous theoretical solution of the flow about the entire configuration is the desirable and comprehensive approach to defining thermal environments about the space shuttle orbiter. Simplified methods for predicting entry heating on leeside surfaces of the orbiter are considered. Wind tunnel heat transfer and oil flow data at Mach 6 and 10 and Reynolds numbers ranging from 500,000 to 73 million were used to develop correlations for the wing upper surface and the top surface of the fuselage. These correlations were extrapolated to flight Reynolds number and compared with heating data obtained during the shuttle STS-2 reentry. Efforts directed toward the wing leeside surface resulted in an approach which generally agreed with the flight data. Heating predictions for the upper fuselage were less successful due to the extreme complexity of local flow interactions and the associated heating environment. A.R.H.

N84-32411*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A HIGH ENERGY STAGE FOR THE NATIONAL SPACE TRANSPORATION SYSTEM
Andrew J. Stofan Washington 1984 13 p refs Presented at the 35th Congr. of the Intern. Astronautical Federation, Lausanne, Switzerland, 7-13 Oct. 1984
(NASA-TM-83795; E-2292; NAS 1.15:83795; IAF-84-15) Avail: NTIS HC A02/MF A01 CSCL 22B

The Shuttle/Centaur is an expendable hydrogen/oxygen cryogenic upper stage for use with the National Space Transportation System. It is a modification of the existing Atlas/Centaur which was used by NASA since 1966 to launch interplanetary and Earth orbital payloads for numerous organizations. Two configurations of the Shuttle/Centaur are being developed. Vehicle capability includes placing approximately 4500 kg (10,000 lb) in geostationary orbit, and initial applications will be for the interplanetary Galileo and Ulysses Missions in 1986. The Shuttle/Centaur development program is discussed, the configurations and performance are described, and the unique integration and operations requirements related to the Shuttle are indicated. Design changes to the current Atlas/Centaur required for Shuttle operation are described here, and include those related to Orbiter cargo bay dimensions, environment, and safety considerations. Author

N84-32412# Mitre Corp., McLean, Va. Metrek Div.
TEST AND EVALUATION OF THE SATELLITE-AIDED MARITIME SEARCH AND RESCUE SYSTEM (SAMSARS). VOLUME 1: SYSTEM DESCRIPTION AND TEST RESULTS Final Technical Report, 1 Jan. 1981 - 31 Oct. 1983
Y. Kaminsky, W. Scales, and J. E. Dieudonne Oct. 1983 287 p refs 2 Vol.
(Contract DO-A01-78-3108)
(PB84-184621; MTR-83W00172-Vol-1; MA-RD-770-83067A-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 13J

The Satellite-Aided Maritime Search and Rescue System (SAMSARS) project development is described. A float-free Emergency Position-indicating Radio Beacon (EPIRB) buoy with 1 to 5 watts of output power is used. Distress information is translated into a spread spectrum signal. The SAMSARS EPIRB signal is designed to be relayed through a maritime commercial satellite (NMARSAT) to a coast at each station. There the signal is processed in the SAMSARS receiver to recover message data. The events leading to the SAMSARS conception, the formation of the concept test period CTP, and the SAMSARS performance during the CTP are examined. A summary description of SAMSARS experimental EPIRB, system capacity computations, ocean wave-induced Doppler effects and CTP Phase 3, 4, and 5 test results is included. GRA

N84-32413# Mitre Corp., McLean, Va. Metrek Div.
TEST AND EVALUATION OF THE SATELLITE-AIDED MARITIME SEARCH AND RESCUE SYSTEM (SAMSARS). VOLUME 2: HARDWARE CIRCUITRY AND SOFTWARE PROGRAMS Final Technical Report, 1 Jan. 1981 - 31 Oct. 1983
Y. Kaminsky, W. Scales, and J. E. Dieudonne Oct. 1983 87 p refs 2 Vol.
(Contract DO-A01-78-3108)
(PB84-184639; MTR-83W00172-Vol-2; MA-RD-770-83067B-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 13J

SAMSARS includes a float-free Emergency Position-Indicating Radio Beacon (EPIRB) buoy with 1 to 5 watts of output power. Distress information translated into a spead spectrum signal. The SAMSARS EPIRB signal is designed to be relayed through a maritime commercial satellite (INMARSAT) to a coast earth station. There the signal is processed in the SAMSARS receiver to recover message data. The calculations of the SAMSARS system performance, detailed description of SAMSARS hardware circuitry

and software programs, and the receiver/processor operating instructions are described in the appendices. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-32414*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
COLUMBIA: THE FIRST FIVE FLIGHTS. ENTRY HEATING DATA SERIES. VOLUME 6: THE UPPER LEESIDE SURFACE CENTERLINE
S. D. Williams Jul. 1984 349 p refs
(Contract NAS9-15800)
(NASA-CR-171795; NAS 1.26:171795; LEMSCO-19346-Vol-6) Avail: NTIS HC A15/MF A01 CSCL 01A

The aerothermodynamic performance of the Space Shuttle Orbiter during reentry is assessed from the collected data of the first five flights. The entry heating data is restricted to the upper leeside surface centerline of the orbiter. Surface heating and temperature data are analyzed by a variety of computer programs and presented in graphic form. Wind tunnel test data is also included. M.A.C.

N84-32415*# Chrysler Corp., New Orleans, La. Engineering Office.
AEROTHERMODYNAMIC DATA BASE Data File Contents Report, Jan. - Jun. 1984
10 Jul. 1984 424 p
(Contract NAS9-16283)
(NASA-CR-171807; NAS 1.26:171807; DMS-DFR-2098) Avail: NTIS HC A18/MF A01 CSCL 01A

Space shuttle aerothermodynamic data, collected from a continuing series of wind tunnel tests, are permanently stored with the Data Management Services (DMS) system. Information pertaining to current baseline configuration definition is also stored. A list of documentation of DMS processed data arranged sequentially and by space shuttle configuration is presented. The listing provides an up to date record of all applicable aerothermodynamic data collected, processed, or summarized during the space shuttle program. Tables are designed to provide survey information to the various space shuttle managerial and technical levels. M.G.

N84-32416*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
COLUMBIA: THE FIRST 5 FLIGHTS ENTRY HEATING DATA SERIES. VOLUME 5: THE SIDE FUSELAGE AND PAYLOAD BAY DOOR
S. D. Williams Jan. 1984 596 p refs
(Contract NAS9-15800)
(NASA-CR-171732; NAS 1.26:171732; LEMSCO-19346-vol-5) Avail: NTIS HC A25/MF A01 CSCL 01A

Entry heating flight data and wind tunnel data on the side fuselage and payload bay door, Z = 400 and 440 trace aft of X/L=0.2, for the first five flights of the Space Shuttle Orbiter are presented. The heating rate data are reviewed in terms of normalized film heat transfer coefficients as a function of angle of attack, Mach number, and normal shock Reynolds number. The surface heatings rates and temperatures were obtained by the JSC NONLIN/INVERSE computer program. Time history plots of the surface heating rates and temperatures are outlined. E.A.K.

N84-32417# Air Force Geophysics Lab., Hanscom AFB, Mass.
SHUTTLE DETACHED SPACECRAFT Final Report, 1 Oct. 1982 - 30 Oct. 1983
R. E. Jacobs 30 Dec. 1983 22 p
(AD-A143320; AFGL-TR-84-0054; AFGL-IP-323) Avail: NTIS HC A02/MF A01 CSCL 22/2

This report reports the results of a year-long in-house effort to investigate the potential utility and economic feasibility of developing a standard shuttle experiment support system to satisfy Air Force Geophysics Laboratory (AFGL) scientific requirements. It is shown that a shuttle detachable spacecraft capable of operating away from the orbiter environment, as well as attached in the cargo bay, maximizes its usefulness as an experiment support platform. A philosophy of minimum shuttle interface and efficient utilization of cargo bay volume is incorporated in an effort to reduce costs and provide greater flexibility for launch opportunities. Author (GRA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N84-32418 Department of the Navy, Washington, D. C.
UNDERWATER DEPTH TELEMETRY Patent
P. W. Verburgt, inventor (to Navy) Issued 24 Jan. 1984 8 p
(AD-D011054; US-Patent-4,428,073; US-Patent-Appl-SN-317028) Avail: US Patent & Trademark Office CSCL 09/6

An acoustic telemetry system and technique are disclosed for remotely measuring the underwater depth and descent rate of hydrographic package. Analog signals indicative of hydrostatic pressure exerted on the package and related to its underwater depth are periodically sampled and converted to an N-bit digital word representative of the value of pressure. Each bit of the digital word operates one a of a plurality of tone generators of different acoustic frequencies in a narrow band, and the outputs of the tone generators are combined with a reference tone continuously generated to permit resolution of Doppler shifts. Acoustically projected through the water to a remote hydrophone, a composite signal representative of the combined tones is corrected for Doppler shifts by translating the frequency of the signal in accordance with shifts detected in the reference tone. The composite signal is digitally decoded to reproduce the N-bit digital word using a parallel series of frequency detectors each tuned to one of the narrow band acoustics frequencies, and the word is displayed as an indication of underwater depth using a series of latches to ensure a steady data display. Author (GRA)

N84-32419# Northeastern Univ., Boston, Mass. Electronics Research Lab.
REMOTE DATA ACQUISITION SYSTEM
N. C. Poirier and T. P. Wheeler 1 Apr. 1984 16 p
(Contract F19628-83-C-0037)
(AD-A143347; SR-1) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report presents a description of a Remote Data Acquisition System. The purpose of this system is to provide a means of acquiring data from scientific instruments and housekeeping functions on sounding rockets which due to their distance from the encoding system could present noise and transient pulse problems. Author (GRA)

N84-32420# Rockwell International Corp., Golden, Colo.
DESIGN OF A DIGITAL TELEMETRY DATA COLLECTION SYSTEM
J. N. Carlson, Jr. Dec. 1983 22 p
(Contract DE-AC04-76DP-03533)
(DE84-013916; RFP-3638) Avail: NTIS HC A02/MF A01

Collecting load data from rotating wind system components which is often an integral part of research and development at the wing energy research center (WERC). A unique digital telemetry system was designed which uses off the shelf components. This flexible system has reduced size and cost, when compared to a previously used telemetry system, and is very accurate in actual applications. The design and operation of this system and the rationale for its use are discussed. DOE

N84-32639*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AVAILABILITY OF THE DSN TELEMETRY DATA SYSTEM AND ITS MAJOR ELEMENTS, INCLUDING THE TWM ASSEMBLIES
R. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 184-191 ref (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-32421 Department of the Air Force, Washington, D.C.
FLEXIBLE, RESILIENT ANTI-CONTAMINATION BAFFLE Patent
J. G. Sliney, Jr., inventor (to Air Force) Issued 15 May 1984 7 p Supersedes AD-D009830
(AD-D011111; US-Patent-4,449,242; US-Patent-Appl-SN-413296; US-Patent-Class-383-103) Avail: US Patent & Trademark Office CSCL 13/11

A flexible, resilient anti-contamination baffle having a plurality of interleaved sheets of material. The sheets of material are secured at one end thereof to a surface adjacent an opening to be sealed and have the capability of not only substantially preventing the passage of gaseous contaminants through the opening when the regions adjacent the openings are of substantially the same pressures but also capable of allowing the rapid venting of gases from a region of higher pressure to a region of lower pressure. Additionally, the sheets of material are formed so as to provide a breakaway capability allowing the passing of an object through the opening without encompassing or entangling the object as it passes therethrough. Author (GRA)

N84-32422*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL PERFORMANCE OF ORTHOGONAL TETRAHEDRAL TRUSS SPACE-STATION CONFIGURATIONS
John T. Dorsey Jul. 1984 38 p refs
(NASA-TM-86260; NAS 1.15:86260) Avail: NTIS HC A03/MF A01

Two 150 kW space station configurations constructed with the orthogonal tetrahedral truss concept are described. One space station consists of a large central platform and two rotating solar wing arrays and the other consists of a long central keel with two rotating arrays. The dynamic characteristics of each configuration are obtained with and without nonstructural components present. The variation in frequencies and mass moments of inertia due to rotation of the two solar wing arrays are given for the long keel space station configuration. The structural performance of the solar wing array is assessed for cases where individual critical struts fail in the array support truss. E.A.K.

N84-32423*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
LINEARIZED DYNAMICAL MODEL FOR THE NASA/IEEE SCOLE CONFIGURATION Interim Report
A. F. Hotz, E. Collins, and R. E. Skelton Hampton, Va. NASA. Langley Research Center Sep. 1984 34 p ref
(Grant NAG1-468)
(NASA-CR-172394; NAS 1.26:172394) Avail: NTIS HC A03/MF A01 CSCL 22B

The linearized equation of motion for the NASA/IEEE SCOLE configuration are developed. The derivation is based on the method of Lagrange and the equations are assembled into matrix second order form. Author

N84-32424*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FOLDABLE SELF-ERECTING JOINT Patent Application
Timothy E. Pelischek, inventor (to NASA) Filed 9 Mar. 1984 11 p
(NASA-Case-MSC-20635-1; NAS 1.71:MSC-20635-1; US-Patent-Appl-SN-588039) Avail: NTIS HC A02/MF A01 CSCL 22B

The invention relates to a foldable self erecting joint which may be used to deploy the tetratruss frame of the proposed shuttle launched triangular space station. The frame must be folded into the payload bay of the space shuttle orbiter. To deploy the frame the tubes are automatically unfolded and once in position should remain safely. A pair of hinged, tubular members in which the hinging is located at corresponding portions of the members are used. The opposite edge portions are connected by spring biased toggle links in the unfolded position. The members are nested against one of the members in substantial alignment and overcenter for securely locking the joint in the unfolded position. E.R.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-32425*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED HEAT EXCHANGER FOR ELECTROTHERMAL DEVICES Patent Application
R. J. Zavesky, J. S. Sovey, M. J. Mirtich, C. Marinos, and P. F. Penko, inventors (to NASA) Filed 31 Jul. 1984 10 p
(NASA-Case-LEW-14037-1; NAS 1.71:LEW-14037-1; US-Patent-Appl-SN-636463) Avail: NTIS HC A02/MF A01 CSCL 21C

This research is concerned with improving electrothermal devices. An electrothermal thruster utilizes a generally cylindrical heat exchanger chamber to convert electricity to heat which raises the propellant temperature. A textured, high emissivity heat element radiatively transfers heat to the inner wall of this chamber that is ion beam morphologically controlled for high absorptivity. This, in turn, raises the temperature of a porous heat exchanger material in an annular chamber surrounding the cylindrical chamber. Propellant gas flows through the annular chamber and is heated by the heat exchanger material. B.W.

N84-32426*# National Aeronautics and Space Administration, Washington, D. C.
THE NASA PHOTOVOLTAIC TECHNOLOGY PROGRAM
Jerome P. Mullin, John C. Loria, and Henry W. Brandhorst, Jr. (NASA. Lewis Research Center) 1984 12 p Presented at the 17th Photovoltaic Specialists Conf., Kissimmee, Fla., 1-4 May 1984; sponsored by IEEE
(NASA-TM-83685; E-2122; NAS 1.15:83685) Avail: NTIS HC A02/MF A01 CSCL 10B

The NASA Office of Aeronautical and Space Technology OAST Program in space photovoltaics is reviewed. From the perspective of national landmark mission requirements and five year and 25-year long range plans, the texture of the program is revealed. Planar silicon and concentrator GaAs array technology advances are discussed. Advances in lightweight (50 micro cell) arrays and radiation tolerance research are presented. Recent progress in cascade cells and ultralightweight GaAs planar cells is noted. Progress in raising silicon cell voltage to its theoretical maximum is detailed. Advanced concepts such as plasmon converters and the Long Duration Exposure Facility LDEF flight experiments pertaining to solar cell and array technology are also shown. M.A.C.

N84-32427*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY DESIGN OF A 10-kW THERMOPHOTOVOLTAIC SYSTEM FOR SPACE APPLICATIONS
Michael F. Piszczor, Jr. and Manju Ghalla-Goradia (Cleveland State Univ.) 1984 15 p refs Presented at the 19th Ann. Intersoc. Energy Conversion Eng. Conf. (IECEC), San Francisco, 19-24 Aug. 1984; sponsored by the AIAA, IEEE, ACS, AIChE, ANS, ASME and SAE
(NASA-TM-83768; E-2259; NAS 1.15:83768) Avail: NTIS HC A02/MF A01 CSCL 21C

A very high degree of reflection of sub-bandgap energy photons from the cell back to the emitter was found to be crucial in achieving high efficiencies for a TPV system. Results show that small increases in reflectance above 0.85 lead to progressively larger increases in cell efficiency. In general, for a required power output, the radiator area, emitter temperature, emitter material and cell temperature may be chosen to satisfy various external constraints. The results can then be used to determine the optimum cell material and its operating temperature. Author

N84-32428*# CHAM of North America, Inc., Huntsville, Ala.
ROCKET INJECTOR ANOMALIES STUDY. VOLUME 1: DESCRIPTION OF THE MATHEMATICAL MODEL AND SOLUTION PROCEDURE Final Report
A. J. Przekwas, A. K. Singhal, and L. T. Tam Aug. 1984 95 p refs 2 Vol.
(Contract NAS3-23352)
(NASA-CR-174702; NAS 1.26:174702; CHAM-H3605/15-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 21H

The capability of simulating three dimensional two phase reactive flows with combustion in the liquid fuelled rocket engines is demonstrated. This was accomplished by modifying an existing three dimensional computer program (REFLAN3D) with Eulerian Lagrangian approach to simulate two phase spray flow, evaporation and combustion. The modified code is referred as REFLAN3D-SPRAY. The mathematical formulation of the fluid flow, heat transfer, combustion and two phase flow interaction of the numerical solution procedure, boundary conditions and their treatment are described. E.A.K.

N84-32429*# CHAM of North America, Inc., Huntsville, Ala.
ROCKET INJECTOR ANOMALIES STUDY. VOLUME 2: RESULTS OF PARAMETRIC STUDIES Final Report
A. J. Przekwas, A. K. Singhal, and L. T. Tam Jul. 1984 71 p refs 2 Vol.
(Contract NAS3-23352)
(NASA-CR-174703; NAS 1.26:174703; CHAM-H3605/16-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 21H

The employment of a existing computer program to simulate three dimensional two phase gas spray flows in liquid propellant rocket engines. This was accomplished by modification of an existing three dimensional computer program (REFLAN3D) with Euler/Lagrange approach for simulating two phase spray flow, evaporation and combustion. The modified code is referred to as REFLAN3D-SPRAY. Computational studies of the model rocket engine combustion chamber are presented. The parametric studies of the two phase flow and combustion shows qualitatively correct response for variations in geometrical and physical parameters. The injection nonuniformity test with blocked central fuel injector holes shows significant changes in the central flame core and minor influence on the wall heat transfer fluxes. E.A.K.

N84-32430# Weapons Systems Research Lab., Adelaide (Australia).
STATIC THRUST AUGMENTATION OF ROCKET MOTORS BY AIR ENTRAINMENT
R. D. Irvine Sep. 1983 26 p
(AD-A143179; WSRL-0332-TR) Avail: NTIS HC A03/MF A01 CSCL 21/8

The effect of duct geometry and primary jet characteristics on the level of thrust augmentation of conventional rocket motor jets, with conical nozzles exhausting into a stationary atmosphere, has been investigated. For a range of straight, cylindrical ducts with bell-mouth inlets, it is found that the duct thrust is primarily a function of duct length and primary thrust. Chamber pressure and nozzle conditions have little effect other than their effect on primary thrust. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-32431*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SYNTHESIS AND CHARACTERIZATION OF PHOSPHORUS-CONTAINING POLYAMIDES AND COPOLYAMIDES BASED ON 1-[(DIALKOXYPHOSPHINYL) METHYL]-2,4- AND -2,6-DIAMINOBENZENES
John A. Mikroyannidis and Demetrius A. Kourtides Aug. 1984 22 p refs
(NASA-TM-85877; A-9377; NAS 1.15:85877) Avail: NTIS HC A02/MF A01 CSCL 07C

Phosphorus containing polyamides and copolyamides were prepared from 1-[(dialkoxyphosphinyl)methyl]-2,4- and -2,6-diaminobenzenes. The polymers produced were characterized by infrared and proton nuclear magnetic resonance spectroscopy, differential scanning calorimetry, and thermogravimetric analysis. Their thermal properties were compared with those of the corresponding common polyamides. In addition, by determining the limiting oxygen index value of some of these polyamides, their fire resistance was evaluated. Author

N84-32432# Tennessee Technological Univ., Cookeville. Dept. of Chemistry.
CLEAVAGE OF AROMATIC CARBON-CARBON BONDS
Eugene A. Kline, William P. Teichert, and Bruce Farnum (North Dakota Univ., Grand Forks) 1984 9 p refs Presented at the 188th Meeting of the Am. Chem. Soc., Philadelphia, 26-30 Aug. 1984
(Contract DE-FC21-83FE-60181)
(DE84-010161; DOE/FE-60181/72; CONF-840805-4) Avail: NTIS HC A02/MF A01

The search for a model substrate for use in evaluating relative reactivity of H donors, under coal liquefaction conditions led to the study of o-terphenyl. Cleavage reaction studies with o-terphenyl show that o-terphenyl couples in the presence of model H donors and many coal derived solvents to form triphenylene, and forms biphenyl by cleavage. In the latter reaction the yields are substantial, and the yields have application to the study of properties of solvents. Attempts to elucidate the mechanism involved kinetic studies, and reaction with a deuterated H donor. The best mechanism appears to be that in which the low steady state concentration of reactive H donor attacks either ipso position in o-terphenyl followed by cleavage. This mechanism occurs at high temperatures. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N84-32433 Delaware Univ., Newark.
STATISTICS OF FRACTURE OF COMPOSITE MATERIALS UNDER MULTIAXIAL LOADING Ph.D. Thesis
Robert Campbell Wetherhold 1983 233 p
Avail: Univ. Microfilms Order No. DA8412692

The distribution of strength of composite materials must be accounted for due to the variability of strength of contemporary composites. A series of models is reviewed, each of which possesses a corresponding distribution function; the Weibull distribution is selected to represent the uniaxial of brittle composites. Macroscopic models for strength are chosen due to the very large number of fiber units contained in the typical composite structure. A statistical model which allows stress interaction for failure under multiaxial stresses is developed. This model may be used to calculate reliability for a weak-link structure under an applied load. The convergence of the developed model is demonstrated using a short off-axis tensile specimen. The strength degradation due to a stress concentration is calculated for the short off-axis and notched plate geometries. The model shows that the local probability of failure per volume is more diffuse in materials with high strength variability. Dissert. Abstr.

N84-32434 Department of the Air Force, Washington, D.C.
LOW COST THERMAL PROTECTION SYSTEM PROCESSING Patent
R. V. Kromrey, inventor (to Air Force) Issued 15 May 1984 7 p Supersedes AD-D009573
(AD-D011142; US-Patent-4,448,742; US-Patent-Appl-SN-370233; US-Patent-Class-264-270) Avail: US Patent & Trademark Office CSCL 13/8

A method and apparatus for spin casting a castable material into a cylindrical body. The method comprises the steps of rotating an elongated cylindrical body about its longitudinal axis, applying an extrudable uncured material as a continuous stram in helical fashion from one point in the body to another point, continuing to rotate the body until the material is leveled and at least partially curing the material while continuing to rotate the body. The apparatus comprises means for holding and spinning an elongated cylindrical body, and extruder means for providing a continuous stream of an extrudable uncured material in a desired fashion along the inside of the cylindrical body. Author (GRA)

N84-32435*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HOLE INTERACTION AND LOAD INTRODUCTION EFFECTS FOR COMPRESSION-LOADED LAMINATES WITH HOLES
Mark J. Shuart Aug. 1984 27 p refs Presented at the Intern. Symp. on Composites: Mater. and Eng., Newark, Del., 24-28 Sep. 1984
(NASA-TM-86287; NAS 1.15:86287) Avail: NTIS HC A03/MF A01 CSCL 11D

The effects of hole interaction and load introduction for [(+ or - 30/90) sub 8](s) and [(+ or - 45) sub 12](s) laminates with holes was conducted. A hole interaction region was identified in some specimens, and this region was ineffective for carrying load. The membrane stiffness of a specimen with a hole interaction region is less than the membrane stiffness of a similar specimen without a hole interaction region. A load introduction effect that occurs on the sublaminate level was also observed. This effect can cause a nonuniform load diffusion into the interior of the specimen. Author

N84-32436*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FAILURE ANALYSIS OF A GRAPHITE/EPOXY LAMINATE SUBJECTED TO BOLT BEARING LOADS
J. H. Crews, Jr. and R. V. A. Naik (Old Dominion Univ., Norfolk, Va.) Aug. 1984 35 p refs
(NASA-TM-86297; NAS 1.15:86297) Avail: NTIS HC A03/MF A01 CSCL 11D

Quasi-isotropic graphite/epoxy laminates (T300/5208) were tested under bolt bearing loads to study failure modes, strengths, and failure energy. Specimens had a range of configurations to produce failures by the three nominal failure modes: tension, shearout, and bearing. Radiographs were made after damage onset and after ultimate load to examine the failure modes. Also, the laminate stresses near the bolt hole calculated for each test specimen configuration, and then used with a failure criterion to analyze the test data. Failures involving extensive bearing damage were found to dissipate significantly more energy than tension dominated failures. The specimen configuration influenced the failure modes and therefore also influenced the failure energy. In the width-to-diameter ratio range of 4 to 5, which is typical of structural joints, a transition from the tension mode to the bearing mode was shown to cause a large increase in failure energy. The failure modes associated with ultimate strength were usually different from those associated with the damage onset. Typical damage sequences involved bearing damage onset at the hole boundary followed by tension damage progressing from the hole boundary. B.W.

N84-32437*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A STUDY OF THE EFFECTS OF END-CAP MOLECULAR SPECIES ON ENVIRONMENTAL CHARACTERISTICS OF POLIMIDESULFONES
Jag J. Singh, Terry L. St.Clair, and Suzanne Walker (St. Andrew's Presbyterian College) Aug. 1984 13 p refs
(NASA-TM-86283; NAS 1.15:86283) Avail: NTIS HC A02/MF A01 CSCL 11D

To improve the environmental stability and mechanical properties of polyimidesulfone (PISO2), it was decided to investigate the effects of various types of end caps on its thermo-mechanical and related properties. It was noted that end caps are effective in reducing the environmental damage susceptibility of PISO2 samples, apparently due to their ability to react with free end groups which are believed to be moisture pickup sites. Phthalic anydride, aniline and aminobenzophenone were the end caps used in this study. B.R.

N84-32438*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HYGROTHERMAL EFFECTS ON MECHANICAL BEHAVIOR OF GRAPHITE/EPOXY LAMINATES BEYOND INITIAL FAILURE
Ori Ishai, Amar Garg, and Howard G. Nelson Aug. 1984 18 p refs
(NASA-TM-86001; A-9844; NAS 1.15:86001) Avail: NTIS HC A02/MF A01 CSCL 11D

An investigation was conducted to determine the critical load levels and associated cracking beyond which a multidirectional laminate can be considered as structurally failed. Graphite/epoxy laminates were loaded to different strain levels up to ultimate failure. Transverse matrix cracking was monitored by acoustic and optical methods. Residual stiffness and strength that were parallel and perpendicular to the cracks were determined and related to the environmental/loading history. Results indicate that cracking density in the transverse layers has no major effect on laminate residual properties as long as the angle ply layers retain their structural integrity. Exposure to hot water revealed that cracking had only a small effect on absorption and reduced swelling when these specimens were compared with uncracked specimens. Cracked, moist specimens showed a moderate reduction in strength when compared with their uncracked counterparts. Within the range of environmental/loading conditions of the present study, it is concluded that the transverse cracking process is not crucial in its effect on the structural performance of multidirectional composite laminates. Author

N84-32439*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SIMPLE RECTANGULAR ELEMENT FOR 2-DIMENSIONAL ANALYSIS OF LAMINATED COMPOSITES
John D. Whitcomb Aug. 1984 31 p refs

(NASA-TM-86291; NAS 1.15:86291) Avail: NTIS HC A03/MF A01 CSCL 11D

A simple rectangular finite element was developed for two dimensional analysis of laminated composite materials. The rectangular laminated composite element eliminates the need to add elements to a model simply to account for the material properties of various laminae. This is particularly advantageous for thick laminates with many lamina. Explicit integration in terms of generalized displacements minimizes the algebraic effort required to derive the element stiffness and the thermal load vector. A substitute shape function technique is used to improve the performance of the element in modeling bending type deformation. Results for several example problems are discussed. Author

N84-32440# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
LOSS FACTORS MEASURED IN METAL MATRIX COMPOSITE MATERIALS Final Report, 14 Sep. 1982 - 30 Nov. 1983
N. S. Timmerman and J. Doherty Watertown, Mass. Army Materials and Mechanics Research Center Jun. 1984 72 p
(Contract DAAG46-82-C-0060; DA Proj. 1L2-63102-D-071)
(AD-A143542; BBN-5520; AMMRC-TR-84-22) Avail: NTIS HC A04/MF A01 CSCL 11/4

The resonant dwell technique was used to measure loss factors at the fundamental frequency of a number of cantilever beam samples (100 to 200 Hz). Nine different metal matrix composites, three unreinforced base metals, and eight configurations of FP(AL203)/ZE41AMg were tested at three temperatures and four peak sample stress levels below 30,000 psi. The results indicate increasing loss factor with increasing stress level. Loss factors of all composites except graphite/aluminum composites were lower than those of the corresponding base metal. For FP/ZE41Mg composites, higher losses were observed with heat treatment, lower fiber volume fraction, and + or - 221/2 deg fiber orientation. Trends of loss factor with temperature varied with material type. Author (GRA)

N84-32441# Cornell Univ., Ithaca, N.Y. School of Mechanical and Aerospace Engineering.
PROBABILISTIC MODELS OF THE STRESS-RUPTURE OF COMPOSITE MATERIALS: SUMMARY Final Report, 15 Jun. 1976 - 14 Jun. 1984
S. L. Phoenix Jun. 1984 35 p refs
(Contract DE-AC02-76ER-04027)
(DE84-013477; DOE/ER-04027/1) Avail: NTIS HC A03/MF A01

Time dependent failure in the long term (stress or creep rupture) results from flaw growth in the fibers, and/or viscoelastic creep in the matrix. Progress was made in modeling the failure process described. A matrix impregnated bundle is viewed as a chain of short microbundles with localized load sharing among fiber elements in a cross-section. The model for fiber failure has its roots in the thermal kinetics of molecular slippage and scission. Various localized load sharing rules for fiber elements in a microbundle have been assumed. Early research focused on static small bundles. Subsequently, three powerful asymptotic methods were developed. Progress was made in modeling statistical failure in 3-D composites with fibers arranged in a hexagonal array, developing asymptotic analyses for the time dependent problem where the load sharing among fibers is elastic but the fiber strength decays stochastically in time and experimental verification of the model. Progress was also made in developing a powerful recursion analysis for k-failure in the time dependent problem. In order to use the results in creep rupture settings, the fiber model was modified to allow for random initial fiber breaks and finite molecular length in the crystal model for fiber failure. Key limit theorems for k-failure were developed thus verifying the existence of the characteristics distribution for composite lifetime. DOE

N84-32442# Department of Energy, Washington, D. C.
METHOD FOR FORMING FIBROUS SILICON CARBIDE INSULATING MATERIAL Patent Application
George C. Wei, inventor (to DOE) Filed 12 Oct. 1983 7 p
(Contract DE-AC05-84OR-21400)
(DE84-014658; US-Patent-Appl-SN-541196) Avail: NTIS HC A02/MF A01

A method whereby silicon carbide bonded SiC fiber composites are prepared from carbon bonded C fiber composites is disclosed. Carbon bonded C fiber composite material is treated with gaseous silicon monoxide generated from the reaction of a mixture of colloidal silica and carbon black at an elevated temperature in an argon atmosphere. The carbon in the carbon bond and fiber is thus chemically converted to SiC resulting in a silicon carbide bonded SiC fiber composite that can be used for fabricating dense, high strength high toughness SiC composites or as thermal insulating materials in oxidizing environments. DOE

N84-32629*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERMODULATION PRODUCT LEVELS IN FLAME-SPRAYED MATERIALS
C. S. Yung, F. W. Stoller, F. L. Lansing, and S. Brazil (Ford Aerospace and Communications Corp., Palo Alto, Calif.) *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 79-98 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 11D

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-32443 United Kingdom Atomic Energy Authority, Risley (England).
GAS CHROMATOGRAPHIC ANALYSIS OF NITROGEN
O. V. Belyaeva 19 Jun. 1984 3 p refs Transl. into ENGLISH from Zaavodskaya Lab. (USSR), 1981 p 19-20
(BLL-Risley-Trans-4563-(9091.9)) Avail: British Library Lending Div., Boston Spa, England

A mixture of N2 - NO - NO - N2O - N2O4 was analyzed, based on the difference in boiling points of oxides of nitrogen/5/. The N2NO4 component is in the form of a dissociating system N2O4 yields 2 NO2 which is recorded as a single peak. The time taken for the analysis of a single specimen is approximately 5 mins. The packed column used does not contain adsorbents. The peaks corresponding to the components being analysed are in the form of triangles with a sharp apex which enables their surface area to be calculated with a high degree of accuracy. A feature of the analysis is the high degree of reproducibility of the results. Author

N84-32444 British Library Lending Div., Boston Spa (England).
THE CONTROLLING REACTIONS DURING INTERACTION BETWEEN SILICON AND CARBON
V. I. Berdnikov, V. G. Mizin, and M. I. Karteleva 19 Jun. 1984 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 10, 1983 p 10-13
(BLL-M-35673-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

An analysis is made of the phase equilibrium of an Si-O-C system comprising 36 elements in a wide temperature range, and the chemical reactions governing the process of silicon-carbon interaction are determined. Author

N84-32445 Department of the Air Force, Washington, D.C.
METHOD FOR THE PARTICLE SIZE INDEPENDENT SPECTROMETRIC DETERMINATION OF METAL PARTICLES IN LUBRICATING OILS AND HYDRAULIC FLUIDS Patent
R. E. Kauffman, W. E. Rhine, and C. S. Saba, inventors (to Air Force) Issued 15 May 1984 5 p
(AD-D011121; US-Patent-4,448,887; US-Patent-Appl-SN-429939; US-Patent-Class-436-60) Avail: US Patent & Trademark Office CSCL 07/4

The degree of wear metal contamination in an oil is deter-

mined by treating a sample of the oil with a mixture of HF/HCl/nitric acid, diluting the oil/acid mixture with a solvent mixture consisting of a nonionic surfactant and a diluent, and spectrometrically analyzing the resulting diluted mixture. Severe wear in an oil wetted apparatus may be detected by directly analyzing spectrometrically a sample of the oil and comparing the results of such analysis with the results obtained according to the acid dissolution method described above. Author (GRA)

N84-32446*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GCKP84-GENERAL CHEMICAL KINETICS CODE FOR GAS-PHASE FLOW AND BATCH PROCESSES INCLUDING HEAT TRANSFER EFFECTS
David A. Bittker and Vincent J. Scullin Sep. 1984 101 p refs (NASA-TP-2320; E-1885; NAS 1.60:2320) Avail: NTIS HC A06/MF A01 CSCL 07D

A general chemical kinetics code is described for complex, homogeneous ideal gas reactions in any chemical system. The main features of the GCKP84 code are flexibility, convenience, and speed of computation for many different reaction conditions. The code, which replaces the GCKP code published previously, solves numerically the differential equations for complex reaction in a batch system or one dimensional inviscid flow. It also solves numerically the nonlinear algebraic equations describing the well stirred reactor. A new state of the art numerical integration method is used for greatly increased speed in handling systems of stiff differential equations. The theory and the computer program, including details of input preparation and a guide to using the code are given. R.J.F.

N84-32447*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SYSTEM FOR CONTROLLING THE OXYGEN CONTENT OF A GAS PRODUCED BY COMBUSTION Patent Application
Jag J. Singh, William T. Davis, and Richard L. Puster, inventors (to NASA) Filed 23 Jul. 1984 10 p
(NASA-Case-LAR-13257-1; NAS 1.71:LAR-13257-1; US-Patent-Appl-SN-633178) Avail: NTIS HC A02/MF A01 CSCL 21B

A mixture of air, CH4 and OH(2) is burned in a combustion chamber to produce a product gas in the test section. The OH(2) content of the product gas is compared with the OH(2) content of reference air in an OH(2) sensor. If there is a difference an error signal is produced at the output of a control circuit which by the means of a solenoid valve, regulates the flow of OH(2) into the combustion chamber to make the error signal zero. The product gas in the test section has the same oxygen content as air. NASA

N84-32448*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUBMILLIMETER, MILLIMETER, AND MICROWAVE SPECTRAL LINE CATALOGUE
R. L. Poynter and H. M. Pickett 1 Jun. 1984 171 p refs
(Contract NAS7-918)
(NASA-CR-173899; JPL-Pub-80-23-Rev-2; NAS 1.26:173899) Avail: NTIS HC A08/MF A01 CSCL 07D

This report describes a computer accessible catalogue of submillimeter, millimeter, and microwave spectral lines in the frequency range between 0 and 10000 GHz (i.e., wavelengths longer than 30 micrometers). The catalogue can be used as a planning guide or as an aid in the identification and analysis of observed spectral lines. The information listed for each spectral line includes the frequency and its estimated error, the intensity, lower state energy, and quantum number assignment. The catalogue has been constructed using theoretical least squares fits of published spectral lines to accepted molecular models. The associated predictions and their estimated errors are based upon the resultant fitted parameters and their covariances. Future versions of this catalogue will add more atoms and molecules and update the present listings (151 species) as new data appear. The catalogue is available from the authors as a magnetic tape recorded in card images and as a set of microfiche records. Author

N84-32449# Naval Academy, Annapolis, Md. Dept. of Physics.
ELECTRICAL AND DIFFERENTIAL SCANNING CALORIMETRY STUDIES OF POLY(ETHYLENE OXIDE) COMPLEXED WITH ALKALINE EARTH THIOCYANATES Interim Report
J. J. Fontanella, M. C. Wintersgill, J. P. Calame, and C. G. Andeen (Case Western Reserve Univ., Cleveland, Ohio) May 1984 29 p Submitted for publication
(AD-A143198; TR-10) Avail: NTIS HC A03/MF A01 CSCL 07/4

Audio frequency dielectric relaxation measurements and differential scanning calorimetry studies have been performed on poly(ethylene oxide) (PEO) complexed with calcium and barium thiocyanate. The measurements were performed over the temperature range 5.5-300K. The relaxation spectrum for the complexed material consists of two peaks. The activation enthalpy for the peak corresponding to the gamma relaxation of pure PEO depends upon the size of the dopant cation. The activation enthalpy for the second peak is independent of the nature of the dopant cation and is very similar to that observed for the alpha c relaxation observed in pure PEO. Next, the room temperature electrical conductivity for the complexed materials is much smaller than that for pure PEO and hence very much less than for PEO complexed with alkali metal salts. However, above Tg, the conductivity rises rapidly and is larger for the barium thiocyanate complexed PEO than for the calcium complexed material. Finally, the DSC studies show that an affect of the ions is to shift the glass transition temperature to high temperatures. Author (GRA)

N84-32450# Naval Academy, Annapolis, Md. Dept. of Physics.
ASSOCIATION AND BOUND MOTION IN ALKALI METAL DOPED CADMIUM FLUORIDE Interim Report
J. J. Fontanella, M. C. Wintersgill, C. G. Andeen (Case Western Reserve Univ., Cleveland), and D. R. Figueroa (Simon Bolivar Univ., Caracas) May 1984 55 p
(NR Proj. 627-793)
(AD-A143200; TR-12) Avail: NTIS HC A04/MF A01 CSCL 07/4

The effects of temperature and hydrostatic pressure on the ionic conductivity and the dielectric relaxation have been measured for lithium-, sodium-, and potassium-doped cadmium fluoride. Activation energies and activation volumes for the association region and for motion of the bound defects have been determined. These were found to depend strongly on the size of the dopant. for the nominally sodium doped material a single relaxation attributable to sodium is observed and is associated with NN fluorine vacancy-sodium substitutional pairs. For the potassium doped material, two distinct relaxations are observed, which suggest the presence of both NN and NNN fluorine vacancy-potassium substitutional dipoles. A single relaxation peak is observed in the lithium doped material. It is attributed either to NN fluorine vacancy-substitutional lithium pairs or to lithium interstitial-lithium substitutional complexes. The activation energy for jumps of bound vacancies is largest for the sodium dopant for which the distortion is the least. The activation energies and the activation volumes for bound vacancy motion were found to be approximately in the same ratio as the values reported for free vacancy motion as expected from dynamical diffusion theories. Author (GRA)

N84-32451# Naval Academy, Annapolis, Md. Dept. of Physics.
NMP, ELECTRICAL RELAXATION, AND HIGH PRESSURE ELECTRICAL CONDUCTIVITY IN ION CONDUCTING POLYMERS Interim Report
J. J. Fontanella, M. C. Wintersgill, and S. G. Greenbaum (Hunter Coll., N.Y.) May 1984 29 p
(NR Proj. 627-793)
(AD-A143202; TR-14) Avail: NTIS HC A03/MF A01 CSCL 07/4

Recent nuclear magnetic resonance (NMR), electrical relaxation, and high pressure electrical conductivity studies of ion

conducting polymers are reviewed. Most of the work discussed is that concerned with poly(ethylene oxide) (PEO) though some recent results concerning poly(vinyl acetate) are also described. A survey of experimental 1H, 7Li, 19F, and 23Na NMR data for ion conducting polymers based on PEO reveals some features that are commonly observed in supersonic solids, such as motional narrowing in the temperature region of enhanced conductivity. The NMR activation energies are generally lower than those for conductivity, indicating the presence of localized motional processes. Previous electrical relaxation data along with new results for PE04.5:NaI and PE04.5:LiCF3S03 make it clear that PEO complexed with different salts exhibits different electrical relaxation spectra. Changes in chain structure are detected along with multiphase behavior. Also, new results are presented for the effect of high pressure on the electrical conductivity of poly(propylene oxide) complexed with alkali metal salts. Those results eliminate some ambiguities associated with previous high pressure electrical conductivity studies of PEO. GRA

N84-32452# Princeton Univ., N. J. Polymer Materials Program.
THE TRANSFORMATION OF LIQUID TO AMORPHOUS SOLID: THE TIME TO VITRIFY FOR STYRENE POLYMERIZATION Technical Report, Apr. - Jun. 1984
Marc T. Aronhime and John K. Gillham Jun. 1984 14 p Submitted for publication
(Contract N00014-84-K-0021)
(AD-A143228; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/4

A model is presented for the calculation of the time to vitrify versus temperature for isothermal polymerization by the chain growth mechanism. The model is based on the glass transition temperature (Tg) rising from its initial value to the reaction temperature. The relationships between Tg and the volume fraction of polymer and monomer, the volume fraction of polymer and the extent of reaction, and the extent of reaction and time, are also required, in a plot of temperature versus time the vitrification curve is S-shaped; the time passes through a maximum just above the the glass transition temperature of the unreacted monomer and passes through a minimum just below the maximum glass transition temperature. The model applies to linear polymerization in which monomer and high molecular weight polymer are the dominant species, i.e., to chain reaction. In this communication the model is applied to the bulk polymerization of styrene by the free radical mechanism. Author (GRA)

N84-32453# Kansas State Univ., Manhattan. Dept. of Chemistry.
CHEMISTRY OF ENERGETIC FRAGMENTS: HYPOVALENT RADICALS Final Report, 1 Oct. 1980 - 29 Feb. 1984
R. N. McDonald and D. W. Setser 25 Jun. 1984 4 p
(Contract DAAG29-80-K-0099)
(AD-A143269; ARO-17369.16-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

The simple method of introducing solid or high-boiling liquids into the flowing afterglow (FA) apparatus by placing the compound in a small beaker and inserting this beaker (attached to a glass rod on a vacuum seal) into the flow tube has been improved. Now the reservoir of the compound is external to the flow tube for purposes of cooling or heating, and the vapors are swept into the flow tube using a controlled He or Ar flow. This method may allow further modification to enable kinetic measurements with such neutral compounds. Studies were completed on the thermochemical properties of (CF3)2C(-), and studies on its chemistry as well as that of the carbanion (CF3)2CH(-). We also started investigations of the thermochemistry and chemistry of a new carbene anion radical CF3CH. We continued to survey the capabilities of the FA method in various reaction types using anionic transition metal complexes. GRA

N84-32454# IBM Research Lab., San Jose, Calif.
RAMAN AND INFRARED SPECTROSCOPY OF MOLECULES ADSORBED ON METAL ELECTRODES
M. R. Philpott, R. M. Corn, W. G. Golden, K. Kunimatsu, and H. Seki Jul. 1984 14 p
(Contract N00014-82-C-0583)
(AD-A143466; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

The use of Raman and infrared spectroscopy to obtain the vibrational spectra of molecules and ions adsorbed at the metal electrode-aqueous electrolyte interface are described. To obtain Raman spectra, we use surface polaritons and roughness to enhanced spectral intensities. In the infrared, we use Fourier transform and modulated reflection-absorption techniques. Raman results for fatty acids, chloride, and thiocyanate on silver electrodes are presented, together with a combined Raman and infrared study of cyanide adsorbed on silver. Author (GRA)

N84-32455# Leeds Univ. (England).
KINETICS AND MECHANISMS OF THERMOLYTIC INTERCONVERSIONS OF BORON HYDRIDES Final Technical Report
R. Greatrex, N. N. Greenwood, and G. A. Jump Jun. 1984 16 p
(Contract DAJA37-80-C-0477)
(AD-A143525) Avail: NTIS HC A02/MF A01 CSCL 07/4

A Mass-spectrometric method for following the kinetics of decomposition and interconversion of the boron hydrides in the gas phase has been perfected. All volatile components of the reacting mixture, including H2 can be analyzed quantitatively and continuously. Gaseous hexaborane (10) has been studied by this method for pressure in the range 1-10 mmHg, and at temperatures between 75 and 165 C. Its decomposition is much slower than applied in the liturature. The main products are hydrogen and a non-volatile solid. GRA

N84-32456# Brookhaven National Lab., Upton, N. Y.
SUMMARY STATUS OF ADVANCED WATER ELECTROLYSIS AND HYDROGEN STORAGE/TRANSPORT RESEARCH AND DEVELOPMENT
A. Mezzina Apr. 1984 19 p refs Presented at Intern. Symp. on Hydrogen Produced from Renewable Energy, Manao, Hawaii, 24 May 1984
(Contract DE-AC02-76CH-00016)
(DE84-012908; BNL-34689; CONF-8405122-1) Avail: NTIS HC A02/MF A01

Major projects within the framework of the U.S. DOE Chemical/Hydrogen Energy Systems Program are described. Goals, accomplishments and status of investigations into advanced water electrolysis and hydrogen storage/transport are summarized. Electrolytic hydrogen production systems include: (1) SPE electrolyzers; (2) static feed water electrolysis; (3) high temperature electrolysis; and (4) other advanced concepts. Hydrogen transport studies emphasize the characterization of hydrogen embrittlement effects on conventional natural gas pipeline steels. DOE

N84-32457# Brookhaven National Lab., Upton, N. Y.
RECENT DEVELOPMENTS IN THERMOLUMINESCENCE KINETICS
P. W. Levy 1984 34 p refs Presented at Natl. Symp. on Thermally Stimulated Luminescence and Related Phenomena, Ahmedabad, India, 1 Feb. 1984
(Contract DE-AC02-76CH-00016)
(DE84-013226; BNL-34839; CONF-840290-1) Avail: NTIS HC A03/MF A01

Thermoluminescence (TL) kinetics were investigated that are more general than those described by the well known 1st and 2nd order kinetic equations. Single glow peak systems studied include the general one-trap kinetic expression from which the 1st and 2nd order kinetics are derived. Glow curves computed from this expression were regarded as data, and their properties determined by inspection and by fitting to the less general 1st and 2nd order kinetics. Often the computed glow curves are well fitted by the 1st and/or 2nd order kinetics over their upper 60 percent, but not in the wings. The best-fit determined kinetic parameters usually differ appreciably from those used to compute the data curves. The properties of the general one-trap kinetics are exemplified by measured glow curves from CaF2:Mn. To describe systems with two or more glow peaks, kinetics were developed that appear to be the simplest possible extension of the general one-trap kinetic expression that describes the retrap-

ping of thermally released charges on all traps present. Called interactive TL kinetics, its properties were also studied by computing glow curves and determining their properties by inspection and fitting to 1st and 2nd order glow peaks. DOE

N84-32458# Purdue Univ., Lafayette, Ind. School of Materials Engineering.
MULTICOMPONENT DIFFUSION UNDER GENERAL CHEMICAL POTENTIAL GRADIENTS Final Report, 1 Jul. 1981 - 30 Jun. 1984
Hiroshi Sato and Ryoichi Kikuchi Jun. 1984 23 p refs
(Contract DE-AC02-81ER-10913)
(DE84-010830; DOE/ER-10913/3) Avail: NTIS HC A02/MF A01

Theoretical basis for identifying the origin of deterioration of high temperature materials by diffusion was investigated. The need for an appropriate form of irreversible statistical mechanics to this problem was identified. The path probability method of irreversible statistical mechanics was adapted for transport problems in multicomponent systems were made. Thermal diffusion was formulated by the path probability method and elusive concepts such as the heat of transport were microscopically identified. An example of demixing of originally homogeneous solid solutions under general chemical potential gradients was worked out. DOE

N84-32459# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
MOLECULAR BEAM MASS SPECTROMETER SAMPLING OF FLASH IGNITED COMBUSTION
D. Lucas, R. Peterson, N. J. Brown, and A. K. Oppenheim Jan. 1984 28 p refs Presented at the 20th Intern. Symp. on Combustion, Ann Arbor, Mich., 12-17 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-006771; LBL-17222; CONF-840801-7) Avail: NTIS HC A03/MF A01

Mass signals from a transient combustion event were measured with a molecular beem mass spectrometer with a time resolution of approximately 100 microseconds. The signals are normalized to signals of inert components to compensate for changes in beam intensity caused by rapidly changing source conditions. Pressure traces recorded simultaneously were used to correlate mass signals to significantly reduce variations in time dependent signals caused by experimental fluctuations. Temperature measurements of the sampled gas using a time flight analysis show that there are no significant perturbations caused by cell walls or the sampling orifice. The measured temperature profile is used to predict the extent of beam overrun present during various phases of the combustion event, which is necessary to determine the validity of the recorded data. Mass signals from reactants and stable products in the flash combustion of methane/oxygen/nitrogen dioxide/argon mixtures are discussed. DOE

N84-32460# Sandia Labs., Albuquerque, N. Mex.
HIGHLY SENSITIVE HIGH RESOLUTION RAMAN SPECTROSCOPY USING RESONANT IONIZATION METHODS
A. Owyoung and P. Esherick May 1984 3 p refs Presented at 9th Intern. Conf. on Raman, Tokyo, 26 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012240; SAND-84-1082C; CONF-840868-1) Avail: NTIS HC A02/MF A01

The introduction of stimulated Raman methods offered orders of magnitude improvement in spectral resolving power for gas phase Raman studies. The inherent weakness of the Raman process suggests the need for significantly more sensitive techniques in Raman spectroscopy. A new approach to this problem is described. The new technique, called ionization detected stimulated Raman spectroscopy (IDSRS), combines high resolution SRS with highly sensitive resonant laser ionization to achieve an increase in sensitivity of over three orders of magnitude. The excitation/detection process involves three sequential steps: (1) population of a vibrationally excited state via stimulated Raman pumping; (2) selective ionization of the vibrationally excited molecule with a tunable UV source; and (3) collection of the ionized species at biased electrodes where they are detected as current in an external circuit. DOE

N84-32461# Sandia Labs., Albuquerque, N. Mex.
DIELECTRIC BREAKDOWN DISTRIBUTIONS OF LARGE DIELECTRIC CONSTANT LIQUIDS
F. J. Zutavern, M. T. Buttram, and M. W. OMalley 1984 22 p refs Presented at 16th Power Modulator Symp., Arlington, Va., 17 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE84-013216; SAND-84-0353C) Avail: NTIS HC A02/MF A01

Area and time dependent dielectric breakdown distributions of ethylene glycol and water solutions cooled to -23 C were reported. Electrode areas of 80, 400, 2000, and 10,000 cm(2) spaced 1 cm apart were repeatedly stressed with voltage pulses exponentially decaying in 5 to 20 ms. Approximately 80,000 measurements concentrated at electric field strengths near the 1% breakdown probability region of the samples were taken in order to obtain statistically accurate data on the dielectric strength of this liquid. DOE

N84-32462# Bendix Field Engineering Corp., Grand Junction, Colo.
CALIBRATION AND PERFORMANCE OF A HIGH-RESOLUTION GAMMA-SPECTROSCOPY SYSTEM
G. Dechant and S. Donivan Jun. 1984 37 p refs
(Contract DE-AC07-76GJ-01664)
(DE84-012792; GJBX-4-84) Avail: NTIS HC A03/MF A01

One of the primary analytical techniques for the determination of radionuclides is high resolution gamma ray spectroscopy. The system used by the Analytical Chemistry Laboratory of Bendix Field Engineering Corporation (Bendix) in support of the U.S. Department of Energy Grand Junction Area Office consists of four Ge(Li) detectors operated under computer control. Quantifying the nuclides of interest is accomplished by comparing the intensities of gamma ray photopeaks in the samples those in certified standards after correcting for self absorption. The success of this method depends on how well the equipment can be calibrated. A general description of the calibration techniques used by Bendix for their high resolution gamma ray spectroscopy system is presented. Complete descriptions of operating procedures and software documentation are contained in separate manuals. DOE

N84-32463# California Univ., Livermore. Lawrence Livermore Lab.
INFLUENCE OF DILUENTS AND INHIBITORS ON DETONATIONS
I. O. Moen (Defence Research Establishment Suffield, Alberta), S. A. Ward (Defence Research Establishment Suffield, Alberta), P. A. Thibault (Victoria Univ., British Columbia), J. H. Lee (McGill Univ., Montreal), R. Knystautas (McGill Univ., Montreal), T. Dean, and C. K. Westbrook 27 Jan. 1984 26 p refs Presented at the 20th Intern. Symp. on Combust., Ann Arbor, Mich., 12-17 Aug. 1984
(Contract W-7405-eng-48)
(DE84-006300; UCRL-90318; CONF-840801-2) Avail: NTIS HC A03/MF A01

The influence of chemical inhibitors and diluents on the detonability of fuel air and fuel oxygen mixtures were determined. The influence of adding small amounts of CF3Br, CF4 and CO2 to ethylene air mixtures was tested. It is shown that the inhibition effect of CF3Br on detonations is not nearly as dramatic as it is on flames. For detonations, the relatively chemically inert diluent CO2 is found to be a better inhibitor than CF3Br. Similar laboratory test with ethylene oxygen and hydrogen oxygen mixtures confirm the results obtained for fuel air mixtures. The addition of small amounts of CF3Br to these fuel oxygen mixtures has a small sensitizing effect, whereas the influence of CO2 is similar to that observed for fuel air mixtures. The results are compared with the prediction of a detailed chemical kinetic model for the oxidation and inhibition processes. It is found that for CF3Br a chemical kinetic scheme derived from flame data predicts a detonation inhibiting effect much larger than that observed. Possible modifica-

tions of this scheme to obtain a consistent description of CF3Br inhibition are proposed. DOE

N84-32464# California Univ., Berkeley. Lawrence Berkeley Lab.
CONDITIONAL VELOCITY STATISTICS IN PREMIXED CH-4-AIR AND C-2H-4-AIR TURBULENT FLAMES
R. K. Cheng, L. Talbot, and F. Robben Jan. 1984 26 p refs Presented at the 20th Intern. Symp. on Combust., Ann Arbor, Mich., 12-17 Aug. 1984
(Contract De-AC03-76SF-00098)
(DE84-012257; LBL-17220; CONF-840801-14) Avail: NTIS HC A03/MF A01

Conditioned fluctuation intensities and Reynolds stress were determined separately for the reactants and for the products in two methane air and two ethylene air v shaped premixed turbulent flames. The conditioned quantities are deduced from velocity data obtained by a two color LDA system using a conditional analysis method based on the presence of a thin flame sheet dividing the two regions. Within the turbulent flame brush, the conditioned turbulent kinetic energy in the reactants remains at the free stream level. The conditioned turbulent kinetic energy in the products, k/sub p/, are higher than in the reactants indicating flame generated turbulence. Also, k/sub p/ increases with distance from the flame stabilizer, x. Nevertheless, the two conditioned Reynolds stresses are comparable. The unconditioned turbulent kinetic energy and Reynolds stress also increase with x. This increase is proportional to the increase in the difference between the conditioned mean velocities (DELTA)U. The magnitude of (DELTA)U suggests significant stream tube divergence. DOE

N84-32465# Hanford Engineering Development Lab., Richland, Wash.
EFFECTIVE THERMOPHYSICAL AND ELASTIC PROPERTIES OF MATERIALS WITH VOIDS
W. G. Wolfer and F. A. Garner 2 Jul. 1984 13 p refs
(Contract DE-AC06-76FF-02170)
(DE84-013942; HEDL-7451) Avail: NTIS HC A02/MF A01

The current theories describing the influence of void swelling on conductive and elastic properties were reviewed and compared with the limited data available. Judgments were made as to the most appropriate equations to describe the influence of voidage on thermal and electrical conductivity, and also the shear, bulk and Young's moduli and Poisson's ratio. DOE

N84-32466# Washington Univ., Seattle.
MULTIVARIATE CURVE RESOLUTION IN LIQUID CHROMATOGRAPHY
D. W. Osten and B. R. Kowalski Dec. 1983 21 p refs
(Contract DE-AT06-83ER-60108)
(DE84-013797; DOE/ER-60108/2) Avail: NTIS HC A02/MF A01

Self-modeling curve resolution has been shown to allow resolution of two co-eluting chromatographic peaks without requiring any assumption of an underlying peak shape. The subsequent problem of quantitation of these co-eluting peaks is limited by both the chromatographic resolution (separation in time and difference in elution profile) and by the degree of spectral uniqueness. An experimental system of two water-soluble vitamins has been used to examine the effects of varying chromatographic resolution on the quantitative accuracy of the curve resolution method. DOE

N84-32467# California Univ., Livermore. Lawrence Livermore Lab.
A COMPREHENSIVE CHEMICAL KINETIC REACTION MECHANISM FOR THE OXIDATION OF n-BUTANE
W. J. Pitz, C. K. Westbrook, W. M. Proscia (Princeton Univ.), and F. L. Dryer 16 Jan. 1984 24 p refs Presented at the 20th Intern. Symp. on Combustion, Ann Arbor, Mich., 12-17 Aug. 1984
(Contract W-7405-eng-48)
(DE84-005739; UCRL-90251; CONF-840801-1) Avail: NTIS HC A02/MF A01

A detailed chemical kinetic reaction mechanism is developed for the intermediate and high temperature oxidation of n-butane. The mechanism, consisting of 238 elementary reactions among 47 chemical species, is validated by comparison between computed and experimental results from shock tubes, turbulent flow reactor, and premixed laminar flames. The model accurately reproduces n-butane combustion kinetics for wide ranges of pressure, temperature, and fuel-air equivalence ratio. In spite of the large number of species and reactions, it is found that computed results are most sensitive to reactions involving the H2-O2-CO submechanism, in agreement with other modeling studies of hydrocarbon oxidation. DOE

N84-32468# NOXSO Corp., Paducah, Ky.
ADSORBENT REGENERATOR Monthly Progress Report, 1 Aug. - 30 Sep. 1983
31 Oct. 1983 14 p
(Contract DE-AC22-82FE-60148)
(DE84-012969; DOE/FE-60148/T3) Avail: NTIS HC A02/MF A01

The detailed design of the prototype moving bed regenerator which will be built and tested is presented. Experimental results from a test series using hydrogen as a reducing gas and a series using a NOXSO sorbent containing an iron catalyst are reported. The results of AAJA attrition tests on chemically cycled sorbents containing 9.1% sodium, with and without the iron catalyst are outlined. DOE

N84-32469# Southern Research Inst., Birmingham, Ala.
MATHEMATICAL MODEL OF ELECTROSTATIC PRECIPITATION (REVISION 3). VOLUME 1: MODELING AND PROGRAMMING Final Report, May 1980 - May 1982
M. G. Faulkner and J. L. Dubard Jun. 1984 471 p refs 2 Vol.
(Contract EPA-R-806216)
(PB84-212679; EPA-600/7-84-069A-Vol-1;
SORI-EAS-82-434-Vol-1) Avail: NTIS HC A20/MF A01 CSCL 07A

The report documents briefly the fundamental mechanisms and limiting factors involved in electrostatic precipitation. It also discusses theories and procedures used in a model to describe the physical mechanisms. It generally describes the major operations performed in a computer program, lists the entire computer program, and defines all variables used in the programs. Improvements in the model include a new way to calculate solutions to the electric field equations, a dynamic way to describe the effects of rapping reentrainment, a way to calculate effluent opacity, and a way to check the input data. The option to use input data expressed entirely in the metric system is provided, as are options to terminate the calculation after calculating V-1 curves and to use an internal data set to estimate precipitator efficiency based on the resistivity of the dust particles. GRA

N84-32470# Southern Research Inst., Birmingham, Ala.
MATHEMATICAL MODEL OF ELECTROSTATIC PRECIPITATION (REVISION 3). VOLUME 2: USER'S MANUAL Final Report, May 1980 - May 1982
M. G. Faulkner and J. L. Dubard Jun. 1984 375 p refs 2 Vol.
(Contract EPA-R-806216)
(PB84-212687; EPA-600/7-84-069B-Vol-2) Avail: NTIS HC A16/MF A01 CSCL 07A

The report gives a comprehensive description of how to use the computer program which performs the calculations in the mathematical model of electrostatic precipitation, and instructs in the proper use of the model. The input and output data associated with the computer program are described in detail and are presented in various forms covering the different uses of the model. The predictions of the model are compared with experimental data, and the agreement obtained is discussed. The various applications of the model are described and demonstrated in detail. Applications of the model for troubleshooting and sizing of precipitators are discussed. Precautions to take in using the model are emphasized throughout. GRA

N84-32471# Ionics, Inc., Watertown, Mass.
REFERENCE PLANT FOR HIGH TEMPERATURE ELECTRO-

DIALYSIS DESALTING OF SEAWATER Final Report
Edgardo J. Parsi, Ted A. Prato, and Thomas A. Susa 28 Jul. 1983 160 p refs
(Contract DI-14-34-0001-7525)
(PB84-195841) Avail: NTIS HC A08/MF A01 CSCL 07A

The objectives of this project was to establish the feasibility of High Temperature Electrodialysis (HTED) in a seawater desalting reference plant. The goal was to increase the energy efficiency and economics of seawater desalting over conventional electrodialysis by operating at temperatures ranging up to 140 F, using improved membranes, and incorporating innovations in the membrane stack and process design. A 30,000 GPD reference plant (expendable to 50,000 GPD) was designed, built and installed at the Wrightsville Beach Test Facility. Field testing was halted by the shutdown of the facility at the end of March, 1983, however, the abbreviated field test demonstrated the efficacy of most of the novel features, and an energy consumption of 40 KWH/Kgal was projected at 4 GFD, 130 F, and 50% water recovery. GRA

N84-33340# Massachusetts Inst. of Tech., Cambridge.
CHEMICAL REACTION DYNAMICS AT SURFACES
Sylvia T. Ceyer, John D. Beckerle, D. Gladstone, Myung B. Lee, M. McGonigal, R. J. Simonson, Sau Lan Tang, and Melissa Hines *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 19-21 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33342# Massachusetts Inst. of Tech., Cambridge.
PHASE TRANSITIONS IN CHEMISORBED SYSTEMS
A. Nihat Berker, D. Blankschtein, J. O. Indekeu, M. Kardar, M. Kaufman, D. Andelman, Robert G. Caflisch, S. R. McKay, R. E. Goldstein, and R. J. Lenk *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 27-30 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-32472 California Univ., Irvine.
CREEP TRANSITIONS IN ALUMINUM SOLID-SOLUTION ALLOYS Ph.D. Thesis
Mahmoud Sayed Ahmed Soliman 1984 145 p
Avail: Univ. Microfilms Order No. DA8410656

The creep behavior of two solid solution alloys of Al, Al-3 at% Mg and Al-10 at% Zn, are investigated over a wide range of stresses and temperatures. The change in the stress exponent from 3 to 5 with decreasing stresses in both alloys and the corresponding change in the features of substructures typical of viscous glide (stress exponent = 3) to those typical of dislocation climb (stress exponent = 5) observed in the Al-3 at% Mg alloy are in conformity with the prediction of the deformation criterion of solid solution alloys that transition from viscous glide controlled to dislocation climb controlled creep can be observed in a single alloy provided a favorable combination between the experimental conditions and the alloy parameters is achieved. Dissert. Abstr.

N84-32473 British Library Lending Div., Boston Spa (England).
THE IMPORTANCE OF IMPACT PRESSURE IN THE DEVELOPMENT OF THE PROCESS OF FORMATION OF BONDS BETWEEN METALS IN THE SOLID PHASE
G. N. Epshtein, S. Yu. Kolesnikov, and E. N. Tukalo 8 Jun. 1984 3 p ref Transl. into ENGLISH from Izv. (USSR) p 139-140
(BLL-M-35656-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

An aluminum-magnesium alloy was welded by a pulsed method to 12Kh18N1OT steel with different impact pressures to determine why increase in pressure provides stronger joints. Results show that as impact pressure increases, the area of the surface bearing traces of its primary treatment decreases and the failure mode of the bimetal alters. A.R.H.

N84-32474 British Library Lending Div., Boston Spa (England).
COMPOSITION AND STRUCTURE OF MULTICOMPONENT VANADIUM- AND NIOBIUM-BASE COATINGS
V. F. Loskutov, V. G. Khizhniak, and M. N. Bobina 8 Jun. 1984 4 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 9, 1983 p 140
(BLL-M-35657-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

Phase X-ray structural, micro-X-ray spectral and metallographic analyses of metal powder mixture after heat treatment for periods of 2,4 and 6 hours are described. Author

N84-32475 United Kingdom Atomic Energy Authority, Risley (England).
WELDABILITY OF STEELS: STUDY OF CRACKING AND METHODS OF EXAMINATION
P. Boquet, H. C. vanElst, L. Rossi, and I. R. Breda 5 Jul. 1984 89 p refs Transl. into ENGLISH of "Soudabilite des Aciers - Etude de la Fissuration et des Methodes d'Examen" rept. EUR-6121fr Commission of European Communities, 1978
(BLL-Risley-Trans-4519-(9091.9)) Avail: British Library Lending Div., Boston Spa, Engl.

The phenomenon of cracking under stainless steel cladding is investigated. Correlation with micrographic tests carried out on steel plates confirms that the simulation test and the criterion based on the chemical composition of the material with a view to evaluate its susceptibility to this type of cracking are valid. The detection and locating of indications greater than two square millimeters is possible; below that limit, structural heterogeneities can lead to a wrong interpretation. Accurate measurement of the dimensions of such defects is impossible. Fatigue tests simulating service (stress, temperature) conditions are conducted on steel specimens clad by overlay welding. The extension of artificial cracks with or without corrosion is measured. Based on fracture mechanics, such cracks do not lead to the rupture of a reactor in the anticipated service conditions. M.A.C.

N84-32476 United Kingdom Atomic Energy Authority, Risley (England).
STRESS CORROSION CRACKING OF STAINLESS STEELS IN SEA WATER AT AMBIENT TEMPERATURE
K. Tanno 5 Jul. 1984 13 p refs Transl. into ENGLISH from Boshoku Gijutsu (Japan), v. 21, no. 5, 1972 p 219-223 In ENGLISH and JAPANESE
(BLL-Risley-Trans-4556-(9091.9)) Avail: British Library Lending Div., Boston Spa, England

One of the major problems with equipment of this kind is protection of the structural materials from corrosion, and the method of control envisaged is to use stainless steel as a high grade corrosion-resistant material, together with electrical protection and protection by coating. However, the use of stainless steel introduces the possibility of stress corrosion cracking, pitting and crevice corrosion. Although many attempts have been made to develop steels with superior resistance to corrosion of this kind, the present study first investigated the susceptibility of some commercial steels to stress-corrosion cracking in sea-water at ambient temperature. A host of experimental studies have been made of the stress-corrosion cracking of stainless steel under laboratory and actual environmental conditions, and have indicated that temperature has a considerable effect; thus, there is said to be little cracking below 100 C and virtually none at ambient temperature. B.W.

N84-32477 United Kingdom Atomic Energy Authority, Risley (England).
CHROMIUM-MAGNESIUM STAINLESS STEELS, RESISTANT TO STRESS CORROSION CRACKING IN MAGNESIUM AND CALCIUM CHLORIDE SOLUTIONS
V. Cihal and F. Poboril 5 Jul. 1984 21 p refs Transl. into ENGLISH from Rev. de Met. (Paris), v. 66, no. 3, 1969 p 199-208
(BLL-Risley-Trans-4571-(9091.9)) Copyright. Avail: British Library Lending Div., Boston Spa, England

Metal components used in the chemical and energy industries are often liable to undergo destruction as a result of corrosion cracking due to simultaneous exposure to the medium and mechanical stresses. One of the most serious forms of stress corrosion is stress corrosion cracking in view of the extremely rapid destruction of the component which has been attacked. Austenitic steels which are resistant to corrosion and creep at high temperatures, undergo typical corrosion cracking in media containing chlorides and hydroxides. The problem of the corrosion cracking of chromium-nickel austenitic steels is investigated in view of their widespread use in the chemical and energy industries.
B.W.

N84-32478 United Kingdom Atomic Energy Authority, Risley (England).
STRESS CORROSION CRACKING OF AUSTENITIC STAINLESS STEELS IN SEA WATER: AN INVESTIGATION OF TEST METHODS
T. Ozaki and O. Nishida 5 Jul. 1984 17 p refs Transl. into ENGLISH from Boshoku Gijutsu (Japan), v. 23, no. 6, 1973 p 221-227
(BLL-Risley-Trans-4568-(9091.9)) Avail: British Library Lending Div., Boston Spa, England

The stress corrosion cracking susceptibility of austenitic stainless steel in a mild environment differs in a number of respects from the results of accelerated tests in Scheil solution etc. Methods of SCC testing in an environment close to sea water were therefore investigated. The following points were established: (1) SCC susceptibility in mild environments differs greatly from that in harsh environments. The order of susceptibility between materials is sometimes rearranged; (2) the latter occurs when the temperature dependence of the electrochemical characteristics of the materials are very different; and (3) SCC characteristics in a mild environment can, to some extent, be predicted by combining the customary accelerated test results with improved testing and electrochemical measurements. Author

N84-32479 British Library Lending Div., Boston Spa (England).
GENERALIZATION OF RESULTS OF ELECTRO-SIMULATION OF TEMPERATURE OF THE PIECE DURING CENTRIFUGAL CLADDING
S. Z. Sapozhnikov and A. A. Pepelov 19 Jun. 1984 9 p refs Transl. into ENGLISH from Izv. (USSR) p 115-119
(BLL-M-35687-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The cladding of inner surfaces of steel or cast iron pieces in which the powdered cladding metal and flux is held against the surface by centrifugal force while heat is applied is considered. Dimensionless nomograms suitable for many typical situations are presented. With correct choice of the model dimensions smulation becomes less laborious and graphs can be plotted for preselected ranges of variation of similarity criteria. A worked example is given. Author

N84-32480 British Library Lending Div., Boston Spa (England).
NUMERICAL CALCULATIONS OF THE FUNCTION OF THE STATIC RECEPTIVITY OF ELECTRONS IN METALS
N. I. Kulikov, O. T. Malyuchkov, and S. I. Yakhimovich 8 Jun. 1984 10 p refs Transl. into ENGLISH from Izv. (USSR) p 79-84
(BLL-M-35640-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

A procedure is described for numerical calculation of the static receptivities of model systems of free and tightly bonded electrons. The integration programme using tetrahedrons provides sufficiently accurate results, and when applied to parametric chromium makes it possible to explain anomalies which exist in its phonon spectrum. Author

N84-32481 British Library Lending Div., Boston Spa (England).
DETERMINATION OF THERMODYNAMIC CHARACTERISTICS OF THE BARIUM DISSOLUTION PROCESS IN LIQUID IRON
L. P. Vladimirov 8 Jun. 1984 9 p refs Transl. into ENGLISH from Izv. (USSR) p 8-11
(BLL-M-35634-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

A procedure developed earlier by the author is used to derive equations for the dissolution of solid barium in liquid iron. Numerical values of the calculation functions of the change in enthalpy, entropy and specific heats on dissolution of barium in liquid iron have been determined. The data obtained enable the equilibrium characteristics of barium in solution in iron with the impurities dissolved in cast iron and steel to be calculated in a single stage. Author

N84-32482 British Library Lending Div., Boston Spa (England).
SOLID-PHASE REACTION OF DISPERSED GRAPHITIZED MATERIAL WITH ALUMINIUM AND NICKEL
A. N. Varenkov and F. A. Goloshchapov 8 Jun. 1984 7 p refs Transl. into ENGLISH from Izv. (USSR) p 4-7
(BLL-M-35633-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The reaction aluminium or nickel coatings with dispersed graphitized material prepared by pyrolysis of polyacrylonitrile at 3020 K has been studied by measurement of electrical resistance with different heat treatments. The measurements with aluminium were made at room temperature, and with nickel during the heat treatment. In both cases the heat treatment involved isothermal holding, precautions being taken to prevent evaporation of the coating metal. Author

N84-32483 British Library Lending Div., Boston Spa (England).
INFLUENCE OF MICROALLOYING WITH TITANIUM AND BORON ON COLD RESISTANCE OF STRUCTURAL STEEL
V. A. Kharchenko, V. V. Melnikova, and Z. A. Saamoilenko 19 Jun. 1984 2 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), no. 10, 1983 p 153
(BLL-M-35698-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The addition of titanium to 24GS1 type steels forces the less surface active harmful impurities out of the grain boundaries, refines these boundaries, and increases cold resistance and impact strength at all temperatures. It was found that larger amounts of titanium cause over saturation of the grain boundaries with titanium. Additional introduction of boron slightly reduces the beneficial effect of titanium and leads to the formation of a heterophase state in the intergranular regions. B.W.

N84-32484 United Kingdom Atomic Energy Authority, Risley (England).
PROCEDURE FOR THE ELECTROPLATING OF SINTERED MATERIALS CONTAINING CARBIDE OR CAST ALLOYS OF TUNGSTEN, MOLYBDENUM, TITANIUM OR ZIRCONIUM
5 Jul. 1984 3 p Transl. into ENGLISH of West German patent no. 750365
(BLL-Risley-Trans-4557-(9091.9)) Avail: British Library Lending Div., Boston Spa, England

A piece of hard metal, containing tungsten, molybdenum, titanium, or zirconium carbide is chemically activated in a caustic solution by cathodic treatment at about 6 volts for about one minute. After this activation the sample is electroplated with iron in an iron bath of known composition. This plating, deposited to a thickness of about eg. 0.001 mm, is heated in a non-oxydizing atmosphere to between 500 and 1000 C for about ten minutes, the higher temperature, the shorter the time needed. This heat treatment leads to a diffusion between the base metal and the plating metal, whereby even the carbon from the base metal diffuses into the plating metal. After heating and subsequent cooling the sample can be either further plated with the same metal or with other metal deposits which naturally adhere well to the diffusion layer. Joints soldered on this intermediate layer adhere so firmly that it is impossible to separate the hard metal from the sample soldered to it, even using high mechanical stress. A.R.H.

N84-32485 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF THE STATE OF MATERIALS IN PLASMA

DEPOSITION OF REFRACTORY COATINGS
A. A. Shershnev, E. F. Mosin, I. P. Tsibin, A. T. Kuznetsov, I. V. Kokushkin, and E. P. Entin 19 Jun. 1984 12 p refs Transl. into ENGLISH from Izv. (USSR) p 110-114
(BLL-M-35686-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

A system of differential equations has been developed for solving thermal-conductivity and thermoelasticity problems in a materials when refractory coatings are applied with the aid of plasma spraying. The presentation of the problem takes account of the movement of the boundary of the layer being sprayed and the temperature dependence of the modulus of elasticity and coefficient of thermal expansion. Computer programs have been written and a solution of the problem run through for the main refractory materials in wide technical use. An analysis is given of the change in the non-stationary temperatures field, and also of the stress and strain field in the base material (substrate) and in the sprayed layer. There are three zones in the material where the stress and strain fields reach extremal values and where breakdown is most likely. Author

N84-32486 British Library Lending Div., Boston Spa (England).
CUBIC SILICON NITRIDE IN IRON-SILICON STEELS
N. S. Mitskevich, I. E. Lev, and G. M. Vorobev 19 Jun. 1984 3 p refs Transl. into ENGLISH from Izv. (USSR) p 91-92
(BLL-M-35653-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The composition of the particular silicon nitride formed when alloy steels or steels deoxidized with silicon are held at different temperatures was investigated. The nitride proves to have a cubic elementary cell and a parameter a = 0.415 nm. It may be formed in steel during isothermal holding, or nitriding 450 to 550 C.Author

N84-32487 British Gas Corp., London (England).
A STUDY OF BETA-HYDROXYAMINES AND BETA-HYDROXYSULPHIDES AS CORROSION INHIBITORS FOR METALS
S. B. Bilalov, M. B. Mamedov, A. G. Konovalchukov, and Sh. F. Sharifova 4 Jun. 1984 9 p refs Transl. into ENGLISH from Ser. Khim. Nauk (USSR), v. 3, 1979 p 39-42 In ENGLISH and RUSSIAN
(BLL-T6313/BG/WH773/84) Avail: British Library Lending Div., Boston Spa, England

The possibility of using as corrosion inhibitors Beta-hydroxyamines and previously synthesized by reacting 2-(p-methoxyphenoxymethyl)-oxirane with various primary and secondary amines and thiols in the presence of an aqueous solution of caustic soda was studied. The structure of the compounds synthesized was established by Ir- and NMR-spectroscopy and also by counter synthesis; their purity was determined by gas-liquid and thin layer chromatography. The literature lacks information on the use of the above mentioned compounds as corrosion inhibitors for metals, and thus the question of the development and the use of new effective and readily available corrosion inhibitors for acidic two-phase media remains a problem. Author

N84-32488 British Gas Corp., London (England).
ON-SITE MEASUREMENT OF THE SPEED OF CORROSION OF A METAL IN WATER
J. B. Mathieu 4 Jun. 1984 23 p Transl. into ENGLISH from Eau du Quebec (Canada), v. 15, no. 2, May 1982 p 132-138 In ENGLISH and FRENCH
(BLL-T6310/BG/WH770/84) Avail: British Library Lending Div., Boston Spa, England

Diverse physico-chemical methods for determining the aggressiveness of water with respect to metals are described including visual and optical observation; ultrasonic inspection; radiography; thermography; acoustic emission; the use of diameter gages; the corrosion coupon (specimen) method; and the Foucart current. Indirect analytical and electrochemical methods are also discussed including the hydrogen probe, the polarization method, the plotting of impedance graphs. The principles of electrochemical corrosion measurements are examined. A.R.H.

N84-32489 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
METAL COATING OF DIAMOND ABRASIVES (REVIEW OF FOREIGN PATENTS)
I. G. Kalinina et al 1983 8 p Transl. into ENGLISH from Almazy (USSR), no. 8, 1981 p 11-13
(CSIR-Trans-1740) Avail: NTIS HC A02

The use of organic- and metal-bonded coatings on diamond tools to increase adhesion strength between tools and diamond grains is investigated. Tools tipped with metal coated diamonds exhibit superior efficiency and wear resistance to tools tipped with uncoated diamonds; the application of metal coatings to diamond leads to reduced diamond consumption in grinding as a result of increased grain and binder strength. Diamonds may be metal coated electrolytically, chemically, mechanically, by precipitation of molten metal, by precipitation of metal from a gaseous medium or by deposition of metal vapor. Foreign patents are examined for examples of each technique. M.A.C.

N84-32490 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
SLAVUTICH HIGH-COBALT WC-Co-MATRIX ALLOY
A. M. Bockovskii et al 1983 5 p refs Trans. into ENGLISH from Sverhtverdye Mater. (USSR), no. 4, 1982 p 14-17
(CSIR-Trans-1739) Avail: NTIS HC A02

The high performance superhard tungsten carbide diamond, WC-Co-matrix composite Slavutich with grain size distribution similar to that of natural and synthetic diamond is examined. The wearability of Slavutich crowns is not inferior to that of crowns tipped witn large natural diamonds. Samples of Slavutich and hard alloys containing six, 15, 40, and 60% by mass of cobalt are subjected to wear resistance tests and subsequent microstructural examination. Those samples with higher percentages of cobalt showed even wear, and no chipping, although small cracks were observed. M.A.C.

N84-32491 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
PASTES OF SUPERHARD MATERIALS (REVIEW OF INVENTIONS)
S. T. Bura 1983 9 p Transl. into ENGLISH from Sverhtverdye Mater. (USSR), no. 4, 1981 p 40-44
(CSIR-Trans-1741) Avail: NTIS HC A02

Inventions relating to pastes and similar compositions prepared from diamond and high density modifications of boron nitride as abrasives are examined. They are in chronological order according to date of priority, together with the name of the applicant. M.A.C.

N84-32492 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
EFFECT OF FORMATION CONDITIONS AND CONTACT ZONE STRUCTURE ON ADHESION STRENGTH OF CARBIDE FORMING METAL COATINGS ON DIAMOND
Ju. V. Naidic 1983 9 p refs Transl. into ENGLISH from Adgezija Rasplavov i Paika Mater. (USSR), no. 7, 1981 p 82-86
(CSIR-Trans-1735) Avail: NTIS HC A02

Little is known about the structure and formation of the diamond and metal contact zone and their effect on adhesion strength. The present paper deals with the effect of formation conditions and interphase zone structure on the strength of hard-phase metal-diamond surface bonds and describes determinations of the mechanical strength of metal coatings formed on the surface of diamond monocrystals under various conditions. This strength is arbitrary defined as the relationship between the normal separation force of an iron bar soldered to a flat metallized diamond surface and the area of the coating thus detached. The details of the method of determination adopted, involving the use of a clamping guide securing the diamond crystal and rod so as to allow free movement perpendicular to the diamond crystal surface is described. B.W.

N84-32493 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.

SINTERED HARD METAL ALLOYS AND PROCESS FOR THEIR MANUFACTURE
Karl Schroeter 1983 8 p Transl. into ENGLISH of German Patent No. 420689 (30 Mar. 1923)
(CSIR-Trans-1748) Avail: NTIS HC A02

The invention concerns a sintered, hard metal alloy of tungsten carbide, suitable for the manufacture of tools and all types of equipment, particularly dies, and which differs from conventional alloys primarily in that it consists of a tungsten carbide with a carbon content of approximately 3 to 7%, and an auxiliary metal with a relatively low melting point such as iron, cobalt or nickel, present in quantities not exceeding 10%. The tungsten therefore constitutes the largest component, namely 80% or more of the total alloy content. The alloy has adequate hardness, and is characterized by exceptional strength as a result of the uniform dispersion of the individual components. The manufacturing process is discussed in detail. Author

N84-32494 Council for Scientific and Industrial Research, Pretoria (South Africa).
OBTAINING IRON-55 WITH HIGH RADIOCHEMICAL PURITY
A. I. Egorov Nov. 1983 4 p refs Transl. into ENGLISH from Radiohimija (USSR), no. 2, 1982 p 262-263
(CSIR-Trans-1751) Avail: NTIS HC A02

A fast and effective process for purifying monoisotopic iron 54 exposed to irradiation from radioactive manganese 54 is described. The method used is based on the extraction of trivalent iron from 6 mol/l HCl in methyl isobutyl ketone and on the reextraction of iron from the organic phase with distilled water. The purification is checked by means of iron analysis (thiocyanate method) and manganese analysis (gamma spectroscopy). In the purification of 0.4 to 6 g iron with radioactivity of up to 1.5 times 10 to the 11th power Bk purification coefficients of from 80,000 to 100,000 are obtained. M.A.C.

N84-32495 British Library Lending Div., Boston Spa (England).
INFLUENCE OF DIRECT CURRENT ON TEMPERATURE GRADIENT IN DIRECTIONALLY SOLIDIFYING INGOT OF ALLOY YuNDK35T5
Yu. A. Leontev and I. V. Gavrilin 19 Jun. 1984 4 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 10, 1983 p 99-101
(BLL-M-35684-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

Experiments were conducted on an industrial Kristall-E installation to study the effect of treating ingots of magnetically hard alloy YuNDK35T5 with direct current during directional solidification. Such treatment increases the temperature gradient in the direction of solidification and thereby improves the quality of ingots with directional and monocrystalline structures. Author

N84-32496 British Library Lending Div., Boston Spa (England).
FEATURES OF BEHAVIOUR OF GAS BUBBLES IN MOLTEN OXIDE FILMS DURING ENAMELLING
V. A. Deryabin, S. I. Popel, and A. A. Perminov 19 Jun. 1984 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 10, 1983 p 6-10
(BLL-M-35672-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The formation and behavior of gas bubbles in molten oxide films during enamelling was examined. Capillary interaction of gaseous inclusions with the silicate melt were considered. Change in the capillary force acting on a gas bubble in the zone of chemical inhomogeneity of the melt of the base coating when the diffusion front of a surface active substance passes along its surface is analyzed. Bubble detachment from the article surface which is enamelled is discussed, and the formation of continuous micropores is examined. E.A.K.

N84-32497 British Library Lending Div., Boston Spa (England).
A PROCEDURE FOR DETERMINING THE TEMPO AT WHICH ALLOYS SOLIDIFY
M. V. Pikunov, I. V. Belyaev, and V. S. Lashuk 8 Jun. 1984 7 p refs Transl. into ENGLISH from Izv. (USSR) p 101-14
(BLL-M-35642-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

Two two phase alloys were investigated. These alloys solidified in different manners within the same temperature range. The apparatus for heating, cooling, quenching and temperature measurement is described. Microstructures were studied and compared with the solidification tempos. B.W.

N84-32498 British Library Lending Div., Boston Spa (England).
DISTRIBUTION OF MICRO-HETEROGENEOUS DEFORMATION IN O6Yu STEEL AROUND INCLUSIONS DURING COMPRESSION
S. I. Gubenko 8 Jun. 1984 8 p refs Transl. into ENGLISH from Izv. (USSR) p 97-100
(BLL-M-35641-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

A theory concerning the origins of failure during compression, on a microscopic scale, of the matrix around nonmetallic inclusions in steel, corundum and spinels in particular is described. Microheterogeneity of deformation, which may decrease as the size of inclusions decreases, is intensified where cracks from inclusions reach the boundary between inclusion and matrix. E.A.K.

N84-32499 British Library Lending Div., Boston Spa (England).
INFLUENCE OF CHOICE OF PAIR-INTERACTION POTENTIAL ON RESULTS OF MODELLING AN EDGE DISLOCATION IN ALPHA-IRON
S. A. Gladyshev, M. A. Baranov, N. V. Gorlov, M. D. Starostenkov, and A. I. Tsaregorodtsev 19 Jun. 1984 10 p refs Transl. into ENGLISH from Izv. (USSR) p 71-75
(BLL-M-35682-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

Factors involved in pair-interaction modeling are considered and a pair interaction potential is proposed for alpha-iron that meets requirements for accurate modeling of crystal properties. The long range empirical potential was obtained from a selection of experimental data (moduli of elasticity, energy of sublimation and lattice parameters) for the material. The short range part of the potential coincides with the statistical potential as calculated for double-ionized iron. Edge dislocation parameters found on the basis of the poential agree with known calculations in the literature. The slope of the dislocation-energy graph is the most sensitive criterion of the suitability of pair potentials for modeling linear defects. Author

N84-32500 British Library Lending Div., Boston Spa (England).
PRODUCING THERMOMAGNETIC ALLOY BY POWDER METALLURGY
N. P. Reutova, S. S. Tikhonov, N. G. Dyakonova, and T. V. Tkachenko 19 Jun. 1984 4 p refs Transl. into ENGLISH from Stal (USSR), no. 10, 1983 p 79-81
(BLL-M-35668-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The possibility of producing ThermoMagnetic (TM) alloys of uniform composition with reproducible TM properties using powder metallurgy is investigated. The results of magnetic tests show that the method of mechanical mixing of the powders does not produce an alloy with uniform composition. Trials using finer powders as the starting materials did not produce significant changes in the results. Thus, with mechanical mixing of powders, it is not possible to produce an alloy with sufficiently high reproducibility of TM properties. Using combined calcium hydride reduction the optimal process conditions are determined and the composition of mixes ensuring production of high quality powders is chosen. Powders of the thermomagnetic Fe/Ni/Cr alloy may be used to produce a multilayer TM material suitable for temperature error reduction in instruments containing magnetic circuits. M.A.C.

N84-32501 British Library Lending Div., Boston Spa (England).
TOPOCHEMICAL REACTIONS AND THE STEFAN PROBLEM
V. P. Konyshev 19 Jun. 1984 3 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 10,

1983 p 1-2
(BLL-M-35671-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The author considers the inaccuracy of existing methods of determining the diffusion kinetics of phase transformations with moving boundaries of interphase transition and presents a more accurate solution using the example of the one-dimensional problem of reactive diffusion. Author

N84-32502*# Polyatomics Research, Inc., Mountain View, Calif.
THEORETICAL RESEARCH PROGRAM TO PREDICT THE PROPERTIES OF MOLECULES AND CLUSTERS CONTAINING TRANSITION METAL ATOMS Final Report, Jul. 1981 - Jul. 1984
Stephen Walch Jul. 1984 97 p refs
(Contract NCC2-148)
(NASA-CR-173924; NAS 1.26:173924) Avail: NTIS HC A05/MF A01 CSCL 11E

The primary focus of this research has been the theoretical study of transition metal (TM) chemistry. A major goal of this work is to provide reliable information about the interaction of H atoms with iron metal. This information is needed to understand the effect of H atoms on the processes of embrittlement and crack propagation in iron. The method in the iron hydrogen studies is the cluster method in which the bulk metal is modelled by a finite number of iron atoms. There are several difficulties in the application of this approach to the hydrogen iron system. First the nature of TM-TM and TM-H bonding for even diatomic molecules was not well understood when these studies were started. Secondly relatively large iron clusters are needed to provide reasonable results. B.W.

N84-32503*# Syracuse Univ., N. Y.
CRACK TIP FIELD AND FATIGUE CRACK GROWTH IN GENERAL YIELDING AND LOW CYCLE FATIGUE Final Report
Zheng Minzhong (Aircraft Strength Research Inst., Xian, China) and H. W. Liu Sep. 1984 94 p refs
(Grant NAG3-348)
(NASA-CR-174686; NAS 1.26:174686) Avail: NTIS HC A05/MF A01 CSCL 11F

Fatigue life consists of crack nucleation and crack propagation periods. Fatigue crack nucleation period is shorter relative to the propagation period at higher stresses. Crack nucleation period of low cycle fatigue might even be shortened by material and fabrication defects and by environmental attack. In these cases, fatigue life is largely crack propagation period. The characteristic crack tip field was studied by the finite element method, and the crack tip field is related to the far field parameters: the deformation work density, and the product of applied stress and applied strain. The cyclic carck growth rates in specimens in general yielding as measured by Solomon are analyzed in terms of J-integral. A generalized crack behavior in terms of delta is developed. The relations between J and the far field parameters and the relation for the general cyclic crack growth behavior are used to analyze fatigue lives of specimens under general-yielding cyclic-load. Fatigue life is related to the applied stress and strain ranges, the deformation work density, crack nucleus size, fracture toughness, fatigue crack growth threshold, Young's modulus, and the cyclic yield stress and strain. The fatigue lives of two aluminum alloys correlate well with the deformation work density as depicted by the derived theory. The general relation is reduced to Coffin-Manson low cycle fatigue law in the high strain region. Author

N84-32504*# United Technologies Corp., East Hartford, Conn. Engineering Div.
MATERIALS FOR ADVANCED TURBINE ENGINES (MATE): PROJECT 3: DESIGN, FABRICATION AND EVALUATION OF AN OXIDE DISPERSION STRENGTHENED SHEET ALLOY COMBUSTOR LINER Final Report
Robert J. Henricks and Keith D. Sheffler Feb. 1984 274 p refs
(Contract NAS3-20072)
(NASA-CR-174691; NAS 1.26:174691; PWA-5574-175) Avail: NTIS HC A12/MF A01 CSCL 11F

The suitability of wrought oxide dispersion strengthened (ODS) superalloy sheet for gas turbine engine combustor applications was evaluated. Incoloy MA 956 (FeCrAl base) and Haynes Developmental Alloy (HDA) 8077 (NiCrAl base) were evaluated. Preliminary tests showed both alloys to be potentially viable combustor materials, with neither alloy exhibiting a significant advantage over the other. Both alloys demonstrated a +167 C (300 F) advantage of creep and oxidation resistance with no improvement in thermal fatigue capability compared to a current generation combustor alloy (Hastelloy X). MA956 alloy was selected for further demonstration because it exhibited better manufacturing reproducibility than HDA8077. Additional property tests were conducted on MA956. To accommodate the limited thermal fatigue capability of ODS alloys, two segmented, mechanically attached, low strain ODS combustor design concepts having predicted fatigue lives > or = 10,000 engine cycles were identified. One of these was a relatively conventional louvered geometry, while the other involved a transpiration cooled configuration. A series of 10,000 cycle combustor rig tests on subscale MA956 and Hastelloy X combustor components showed no cracking, thereby confirming the beneficial effect of the segmented design on thermal fatigue capability. These tests also confirmed the superior oxidation and thermal distortion resistance of the ODS alloy. A hybrid PW2037 inner burner liner containing MA956 and Hastelloy X components was designed and constructed. Author

N84-32505*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESPONSE OF INCONEL 617 SUPERALLOY TO COMBINED GROUND-BASED AND STS REENTRY EXPOSURE
Ronald K. Clark and Jalaiah Unnam (Analytical Service and Materials, Inc., Tabb, Va.) Aug. 1984 9 p refs Presented at the 19th Thermophys. Conf., Snowmass, Colo., 25-28 Jun. 1984
(NASA-TM-86293; NAS 1.15:86293; AIAA-84-1768) Avail: NTIS HC A02/MF A01 CSCL 11F

Inconel 617 is a nickel-based superalloy which is being considered for heat-shield applications because of its high-temperature strength, good oxidation resistance and high emittance of oxidized surfaces. While the effects of simulated reentry conditions on emittance and oxidation of Inconel 617 have been studied, the combined effects of the ground-based environment with sea salt exposure and the reentry environment have not been evaluated. Experimental results are presented to show the effects of environmental simulation including ground-based and reentry exposure on the emittance and oxidation of Inconel 617. Specimens were exposed to simulated reentry at a surface temperature of 2000 F in the Langley Research Center Hypersonic Materials Environmental Test System (HYMETS) Facility with and without alternate exposures to an atmospheric seashore environment or a laboratory sea salt environment. This paper presents emittance, mass loss, oxide chemistry, and alloy composition data for the specimens. Author

N84-32506*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESIDUAL MECHANICAL PROPERTIES OF Ti-6Al-4V AFTER SIMULATED SPACE SHUTTLE REENTRY
Ronald K. Clark and Jalaiah Unnam (Analytical Service and Materials, Inc.) Aug. 1983 23 p refs Presented at the Ann. Meeting of TMS-AIME, Los Angeles, 28 Feb. - 2 Mar. 1984
(NASA-TM-86294; NAS 1.15:86294) Avail: NTIS HC A02/MF A01 CSCL 11F

Oxidation and embrittlement are concerns in use of titanium foils for shielding advanced space transportation system vehicles during Earth reentry. Ti-6Al-4V in 0.003 in. and 0.035 in. thicknesses were exposed to multiple cycles of simulated space transportation system ascent/reentry conditions at temperatures ranging from 1000 F to 1200 F. Residual mechanical tests and metallurgical analyses were made on the specimens after exposure. Results show that tensile elongation is the mechanical property most affected by the reentry environment. Results are presented to show a comparison of residual properties of foil specimens from static oxidation exposure and cyclic oxidation exposure. Author

N84-32507*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF ALLOY CHEMISTRY AND EXPOSURE CONDITIONS ON THE OXIDATION OF TITANIUM
Jalaiah Unnam (Analytical Service and Materials, Inc.), R. N. Shenoy, and Ronald K. Clark Aug. 1984 21 p refs Presented at the Ann. Meeting of TMS-AIME, Los Angeles, 28 Feb. - 2 Mar. 1984
(NASA-TM-86295; NAS 1.15:86295) Avail: NTIS HC A02/MF A01 CSCL 11F

Multiwall is a new thermal protection system concept for advanced space transportation vehicles. The system consists of discrete panels made up of multiple layers of foil gage metal. Titanium is the proposed candidate metal for multiwall panels in the reentry temperature range up to 675 C. Oxidation and embrittlement are the principal concerns related to the use of Ti in heat shield applications. The results of a broad study on the oxidation kinetics of several titanium alloys subjected to different exposure conditions are described. The alloys include commercially pure titanium, Ti-6Al-4V, and Ti-6Al-2Sn-4Zr-2Mo. Oxidation studies were performed on these alloys exposed at 704 C in 5-760 torr air pressure and 0 to 50% relative humidity. The resulting weight gains were correlated with oxide thickness and substrate contamination. The contamination depth and weight gains due to solid solutioning were obtained from microhardness depth profiles and hardness versus weight percent oxygen calibration data. Author

N84-32508*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MICROSTRUCTURE AND SURFACE CHEMISTRY OF AMORPHOUS ALLOYS IMPORTANT TO THEIR FRICTION AND WEAR BEHAVIOR
Kazuhisa Miyoshi and Donald H. Buckley [1983] 23 p refs To be presented at the Intern. Tribology Conf., Tokyo, 8-10 Jul. 1985; sponsored by the Japan Soc. of Lubrication
(NASA-TM-83762; E-2213; NAS 1.15:83762) Avail: NTIS HC A02/MF A01 CSCL 11F

An investigation was conducted to examine the microstructure and surface chemistry of amorphous alloys, and their effects on tribological behavior. The results indicate that the surface oxide layers present on amorphous alloys are effective in providing low friction and a protective film against wear in air. Clustering and crystallization in amorphous alloys can be enhanced as a result of plastic flow during the sliding process at a low sliding velocity, at room temperature. Clusters or crystallines with sizes to 150 nm and a diffused honeycomb-shaped structure are produced on the wear surface. Temperature effects lead to drastic changes in surface chemistry and friction behavior of the alloys at temperatures to 750 C. Contaminants can come from the bulk of the alloys to the surface upon heating and impart to the surface oxides at 350 C and boron nitride above 500 C. The oxides increase friction while the boron nitride reduces friction drastically in vacuum.
Author

N84-32509# Michigan Technological Univ., Houghton.
MICROSTRUCTURAL DEVELOPMENT AND CONTROL IN LIQUID PHASE SINTERING; PROCESSING, STRUCTURES AND PROPERTIES OF COLD WORKED METAL MATRIX COMPOSITES Final Report, 15 Mar. 1981 - 30 Apr. 1984
T. H. Courtney and J. K. Lee 3 Jun. 1984 24 p
(Contract DAAG29-81-K-0047)
(AD-A143188; ARO-17877.6-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

This report summarizes efforts and accomplishments in the areas noted in the title. Structural analysis of Liquid Phase Sintering materials is clarified in terms of solid phase contiguity and scale; the later being predictively so. Mechanisms for structural evolution in LPS products are also explained. Mechanical processing capabilities of in situ metal matrix composites are developed and the properties obtained in them are measured and compared with theories for the same. Guidelines for developing high strength cold worked metal matrix composites are presented. Author (GRA)

N84-32510# Dayton Univ., Ohio. Research Inst.
MECHANICAL PROPERTY DATA 15-5PH (H1025) STAINLESS STEEL ALLOY: HOT-ROLLED PLATE
May 1984 6 p
(Contract F33615-82-C-5102)
(AD-A143327; UDR-TM-84-14) Avail: NTIS HC A02/MF A01 CSCL 20/11

The 15-5PH stainless steel alloy was obtained as hot-rolled plate that was solution annealed and pickled. Each plate was heat-treated separately to the H1025 condition. The average values for each mechanical property are listed by plate direction. Due to the large numbers of data points (50 each from multiple heats for notched and unnotched specimens), only fatigue data were generated from one heat only and are presented as curves in Figures 3 and 4. GRA

N84-32511# Dayton Univ., Ohio. Research Inst.
MECHANICAL PROPERTY DATA 7175-t736 ALUMINUM ALLOY: HAND FORGING
Jun. 1984 6 p
(Contract F33615-82-C-5102)
(AD-A143328; UDR-TM-84-20) Avail: NTIS HC A02/MF A01 CSCL 20/11

This 7175 Aluminum Alloy, heat-treated to the T736 temper, was produced by ALCOA as a hand forging. Six plates were received in thicknesses ranging from 2 to 6.25 inches, widths ranging from 12 to 16 inches, and lengths of either 30 or 31 inches. This report contains data generated only from these six plates (heats). GRA

N84-32512# Department of the Air Force, Washington, D.C.
METHOD TO REVEAL MICROSTRUCTURES IN SINGLE PHASE ALLOYS Patent Application
I. Weiss, F. H. Froes, and D. Eylon, inventors (to Air Force) Filed 30 Mar. 1984 11 p
(AD-D011094; US-Patent-Appl-SN-595153) Avail: NTIS HC A02/MF A01 CSCL 11/6

This abstract discloses a method for revealing the microstructure of metal alloys which comprises the steps of polishing the sample, chemically etching the polished metal surface, thermally etching the chemically etched surface and quenching the thermally etched sample. This method allows observation of deformed and recrystallized grains on the same polished surface and provides the opportunity to correlate recrystallized grains to their nucleation sites. GRA

N84-32513# Hanford Engineering Development Lab., Richland, Wash.
FUNDAMENTAL ALLOY STUDIES
H. R. Brager and F. A. Garner 2 Jul. 1984 10 p refs
(Contract DE-AC06-76FF-02170)
(DE84-013941; HEDL-7444) Avail: NTIS HC A02/MF A01

Four alloy groups were produced to investigate the origin of swelling and creep resistance in the Fe-Ni-Cr austenitic system and also to explore the possible existence of a high swelling resistance in the corresponding Fe-Cr-Mn austenitic system. This extension is based on a correlation observed between swelling resistance and the analomous property regime commonly referred to as the Invar regime. Many of these alloys were recently included in irradiation experiments conducted in EBR-II, HFIR and FFTF. DOE

N84-32514# Los Alamos Scientific Lab., N. Mex.
PRESSURE-DEPENDENT RESISTIVE BEHAVIOR OF YbBe13
J. D. Thompson, Z. Fisk, and J. C. Willis 1984 3 p refs Presented at 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15 Aug. 1984
(Contract W-7405-eng-36)
(DE84-010068; LA-UR-84-889; CONF-840842-11) Avail: NTIS HC A02/MF A01

The effect of hydrostatic pressures up to 16 kbar on the temperature-dependent resistance of YbBe13 was studied. Anomalies in the low-temprature resistance are discussed in terms of

an antiferromagnetically ordered ground state and resonant scattering off thermally populated crystalline electric field levels. A comparison is made to the resistive behavior of UBe13. No evidence for superconductivity in YbBe13 above 0.08(0)K was found. DOE

N84-32515# Los Alamos Scientific Lab., N. Mex.
THERMOMAGNETIC PROPERTIES OF GdPd
J. A. Barclay, W. C. Overton, Jr., and C. B. Zimm 1984 3 p refs Presented at 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15 Aug. 1984
(Contract W-7405-eng-36)
(DE84-009991; LA-UR-84-1053; CONF-840842-8) Avail: NTIS HC A02/MF A01

The magnetic susceptibility, magnetization, and field-dependent heat capacity of ferromagnetic GdPd was measured. The magnetic moment of the Gd spin obtained from the saturation magnetization at 4.2(0)K is enhanced over the free Gd value. The heat capacity shows a large lambda-type magnetic anomaly at the Curie temperature of 40.0 + 0.5(0)K. DOE

N84-32516# Rice Univ., Houston, Tex.
SUPERSONIC METAL CLUSTER BEAMS Technical Progress Report, 16 Mar. 1983 - 15 Mar. 1984
R. E. Smalley 1984 27 p refs
(Contract DE-AS05-78ER-06035)
(DE84-012976; DOE/ER-06035/6) Avail: NTIS HC A03/MF A01

Developments in laser and molecular beam technology made possible the production of supersonic beams of metal clusters of virtually any metal in the periodic table. The metal-metal bond in transition metal dimers, including Cr2, Mo2, V2, and Ni2 through resonant two photon ionization spectroscopy were investigated. The importance of 3d (and 4d) electrons in the metal-metal bond in Cr2, Mo2, and V2 was demonstrated. A comparison of V2 and Cr2 illustrates the importance of the 3d contraction with increasing nuclear charge, and it is found that this of central concern in No2, where no 3d contribution to the chemical bond is found. The Cu3 is investigated, which provides the first gas phase spectrum of a triatomic transition metal cluster. Electronically, Cu3 is analogous to Na3 and other alkali trimers and the observed spectrum is explaind as arising from a Jahn-Teller distored (2)E' state (in D/sub 3h/symmetry), as is calculated for Li3. The observed transition in Cu3 is assigned to be (2)E'' reverse arrow (2)E, with both upper and lower states undergoing Jahn-Teller distortions. DOE

N84-32517# Colorado School of Mines, Golden.
FERROUS ALLOY METALLURGY, LIQUID LITHIUM CORROSION AND WELDING Final Report, 1 Apr. 1973 - 31 Mar. 1984
D. L. Olson and D. K. Matlock 31 Mar. 1984 21 p refs
(Contracts DE-AC02-76ER-02313; EY-76-S-02-2313)
(DE84-014656; DOE/ER-02313/14; COO-2313-14) Avail: NTIS HC A02/MF A01

An evaluation of the corrosion behavior of ferrous alloys in liquid lithium, and a study of microstructure development and properties of dissimilar metal weldments were conducted. A ten-year overview of the research accomplishments made is presented. The effects of liquid lithium on both uniform corrosion and grain boundary penetration in ferrous alloys was investigated as a function of time, temperature, base metal alloy content, and liquid lithium nitrogen content. Kinetic equations for the various corrosion processes were developed and analyzed with respect to models for corrosion and corrosion product development. The effects of liquid lithium on mechanical properties, particularly fatigue, were studied. In both austenitic stainless steels and ferritic steels, liquid lithium significantly reduces the mechanical integrity of all materials by inducing liquid metal embrittlement. A model for liquid metal embrittlement induced damage during fatigue was developed and shown to correlate with the experimental results. DOE

N84-32518# Oak Ridge National Lab., Tenn.
CHEMICAL VAPOR DEPOSITION OF EROSION RESISTANT TiB-2 COATINGS
A. J. Caputo, W. J. Lackey, and I. G. Wright (Battelle Columbus Labs, Ohio) 1984 31 p refs Presented at the 9th Chem. Vapor Deposition Conf., Cincinnati, 6 May 1984
(Contracts DE-AC05-84OR-21400; W-7405-eng-26)
(DE84-012351; CONF-8405190-1) Avail: NTIS HC A03/MF A01

Coatings of TiB2 were chemically vapor deposited by hydrogen reduction of TiCl4 and BCl3. Process variables were deposition temperatures from 750 to 1050(0)C and the TiCl4 and BCl3 flow rates. Various grades of commercially available cemented carbides and experimental nickel bonded TiB2 were used as substrates. Resistance of the coatings to erosion was evaluated using a hot, coal-oil slurry impingement test. The TiB2 deposition rate was temperature dependent ranging from 0.1 to 2.9 (MU)m/min between 750 and 950(0)C. The surface morphology of the coatings was nodular with the size of the nodules increasing with temperature. The coatings were dense and adherent. The grain size varied with deposition conditions. The TEM showed that the grain size was very small, increasing with distance from the substrate. Electron microscopy and X ray diffraction indicated only the presence of single phase TiB2 and ion microprobe analysis revealed a constant Ti/B ratio across the coating thickness. Energy dispersive fluorescence analyses showed coatings deposited at 800(0)C contained more chlorine than coatings deposited at the higher temperatures. Coating microhardness and erosion resistance were temperature dependent. The hardness of coatings deposited at 800 and 900(0)C were 15 and 32 GPa, respectively. Coatings deposited at 850(0)C or below experienced extensive erosion while those deposited at 900(0)C and above showed very little or no erosion. DOE

N84-32519# Dartmouth Coll., Hanover, N.H. School of Engineering.
ROLE OF GRAIN SIZE ON THE BRITTLE TO DUCTILE TRANSITION OF THE STRONGLY ORDERED ALLOY NI3AI Final Report
E. M. Schulson 14 Jul. 1984 26 p refs
(Contract DE-AC02-81ER-10907)
(DE84-014904; DOE/ER-10907/1) Avail: NTIS HC A03/MF A01

The results of a three-year study on the effects of grain size on the mechanical properties of Ni3Al and of Ni3Al alloyed with boron and with boron plus titanium are discussed. Data on strength (in tension and in compression) and on ductility at 1 x 10(-4)s(-1) at temperatures from 77 to 1023(0)K are given. Information on the structure of rapidly solidified powers (from which most of the alloys were made) and on deformation structures is given. Static and dynamic recrystallization are also discussed, as in flow localization accompanying intergranular fracture. DOE

N84-32520# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Materials Science and Mineral Engineering.
MICROSTRUCTURE, MECHANICAL PROPERTIES AND TWO-BODY ABRASIVE WEAR RESISTANCE OF AN Fe-3Cr-C BASED ULTRA-HIGH STRENGTH STEEL M.S. Thesis
Y. S. Yoon May 1984 51 p refs
(Contract DE-AC03-76SF-00098)
(DE84-014605; LBL-17277) Avail: NTIS HC A04/MF A01

An ultrahigh strength steel based on Fe-3Cr-0.4C for structural and abrasive applications was designed and its structure property relationships established. The microstructure was characterized as dislocated lath martensite containing fine carbides and surrounded by thin films of retained austenite. This results in excellent combination of mechanical properties and abrasion resistance which are attractive in comparison to many commercial abrasion resistant alloys. It was shown that the abrasion resistance mainly depends on the hardness. Tempered martensite embrittlement occurs in the tempering temperature range of 300 to 400 C and was confirmed to be coincident with the decomposition of interlath retained austenite into stringers of coarse cementite. Epsilon carbide was found in the as quenched condition and in the 200 C tempered condition. The most likely sites for the information of

the cementite are shown to be the epsilon carbide interfaces with the matrix and as the cementite particles grow, the epsilon carbide particles gradually disappear. DOE

N84-32521# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Materials Science and Mineral Engineering.
EFFECT OF PRECIPITATED AUSTENITE ON THE FRACTURE OF A FERRITIC CRYOGENIC STEEL M.S. Thesis
D. R. Frear May 1984 92 p refs
(Contract DE-AC03-76SF-00098)
(DE84-014604; LBL-17910) Avail: NTIS HC A05/MF A01

The effect of precipitated austenite on the fracture of an Fe-8Ni-2Mn-0.1 Ti steel was investigated. To understand the effect an attempt was made to correlate the microstructure, mechanical properties, and the fracture surface appearance of specimens heat treated to contain austenite or be austenite free. The fracture surfaces were quantitatively studied using a 3D imaging technique in the SEM. It was found that the presence of austenite had a beneficial influence on mechanical properties by lowering the DBTT. Part of this decrease was found to be due to the austenite gettering deleterious elements off the grain boundaries. Specimens that contained precipitated austenite were also found to have a smaller median facet size, when fractured in a brittle transgranular mode, than specimens with no austenite. The decrease in DBTT and change in fracture surface appearance is related to the austenite transforming to martensite of a different variant than the matrix which effectively grain refines the steel and raises the cleavage stress. DOE

N84-32522# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
ION BOMBARDMENT DAMAGE IN A MODIFIED Fe-9Cr-1Mo STEEL
K. Farrell and E. H. Lee 1984 18 p refs Presented at the 12th Intern. Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014288; CONF-840604-10) Avail: NTIS HC A02/MF A01

A normalized and tempered Fe-9Cr-1Mo steel, with small Nb and V additions, was bombarded with 4-MeV iron ions to 100 dpa at 400, 450, 500, 550, and 600 C. Major damage feature was dislocation tangles which coarsened with increasing bombardment temperature. Sparse cavities were heterogeneously distributed at 500 and 550 C. Incorporation of helium and deuterium simultaneously in the bombardments at rates of 10 and 45 appM/dpa, respectively, introduced very high concentrations of small cavities at all temperatures, many of them on grain boundaries. These cavities were shown to be promoted by helium. A small fraction of the matrix cavities exhibited bias driven growth at 500 and 550 C, with swelling $< 0.4\%$. This is a very narrow temperature range for bias driven swelling. It is about 125 C higher than the peak swelling temperature found in neutron irradiation, which is compatible with the higher damage rate used in the ion bombardments. High concentrations of subgrain boundaries and dislocations resulting from the heat treatment, and unbalanced cavity and dislocation sink strengths in the damage structures contribute to the swelling resistance. Such resistance may not be permanent. High densities of bubbles on grain boundaries indicate a need for helium embrittlement tests. DOE

N84-32523# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
PROCESSING AND CONSOLIDATION OF RAPIDLY SOLIDIFIED ALLOYS: A TECHNOLOGY ASSESSMENT
J. E. Flinn Jun. 1984 223 p refs
(Contract DE-AC07-76ID-01570)
(DE84-014673; EGG-SCM-6595) Avail: NTIS HC A10/MF A01

A review and evaluation were performed on rapid solidification technology (RST). This technical assessment focused on strategic and critical materials, particularly involving chromium utilization in austenitic stainless steels. The RST could provide significant reduced usage of chromium in stainless steels. Beneficial features include improved chemical homogeneity, fine structures, extended solute solubility, and metastable phases. Methods for producing rapidly solidified materials were assessed and appear to cover a wide range of cooling rates, 10 to 10(7) K/s. The fundamentals associated with rapid solidification processing (RSP) are not well understood. Areas requiring in-depth study include the role of constituents in alloys, nonequilibrium aspects of phase diagrams, nucleation and growth phenomena, contribution and roles of undercooling and solidification rate, metastable phase behavior and stabilization, procesing diagnostics, and structure/property correlations with processing parameters. DOE

N84-32524# Bureau of Mines, Albany, Oreg.
LOW-CHROMIUM HEAT-RESISTING FERRITIC ALLOYS STRENGTHENED BY THE CHI PHASE
M. L. Glenn and J. S. Dunning 1984 25 p refs
(PB84-199041; BM-IC-8860; LC-83-600362) Avail: NTIS HC A02/MF A01 CSCL 11F

The Bureau of Mines is conducting research on substitutes for chromium containing alloys in order to conserve imported critical and strategic materials. Part of this research concentrates on finding low chromium substitutes for heat resisting stainless steels for the temperature range 600 to 800 C. Ferritic alloys are emphasized that have oxidation resistance provided by chromium contents as low as 10 pct and stress rupture strength provided by the precipitation of the chi phase intermetallic compound. (Fe36Cr12 (Mo, Ti)10). Initially, research was concentrated on selecting an alloy composition having a minimum chromium content with strengthening provided by the chi phase. An Fe-(10-12 pct)Cr-6 pct Mo-(1.5-2.0 pct)Ti alloy was selected. Author (GRA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-32525 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
COATINGS ON DIAMOND AND CBN ABRASIVES (REVIEW OF INVENTIONS)
V. M. Mogilevskii et al 1983 11 p Transl. into ENGLISH from Sverhtverdye Mater. (USSR), no. 2, 1981 p 38-42
(CSIR-Trans-1742) Avail: NTIS HC A02

Inventions pertaining to diamond coatings and cubic boron nitride abrasives are reviewed. A short description of the invention, applicant identification, and country of origin of the invention are included. M.A.C.

N84-32526 Council for Scientific and Industrial Research, Pretoria (South Africa).
A DIFFUSION MECHANISM IN THE CATALYTIC CONVERSION OF CARBONACEOUS MATERIALS INTO DIAMONDS AT HIGH PRESSURES
N. N. Kuzin and A. A. Semercan 1983 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 266, no. 1, 1982 p 100-104
(CSIR-Trans-1743) Avail: NTIS HC A02

The mechanism of catalytic conversion of carbonaceous materials (e.g., graphite) into diamond under the action of metal catalysts in the diamond stability pressure and temperature region has not as yet been fully elucidated. The present paper examines the formation of diamond by crystallization from a supersaturated solution of liquid metal catalyst. The principal aspects of this phenomenon, identified by the isotope analysis of spectrally pure graphite and diamonds using Ni or Ni-Mn as catallytic solvent at a pressure of 58 kbars and a temperature of 1700 K are discussed. B.W.

N84-32527 Council for Scientific and Industrial Research, Pretoria (South Africa).
DEVELOPMENT AND TESTING OF GLASS COATINGS FOR HEXANITE-A POWDERS

A. E. Silo Oct. 1983 5 p refs Transl. into ENGLISH from Adgezija Rasplavov i Paika Materialov (USSR), v. 8, 1981 p 83-85
(CSIR-Trans-1747) Avail: NTIS HC A02

An experimental batch of 100% hexanite wheels with various grain size with and without glass coating BS1 organic binder was manufactured with a view to assessing the effect of coating on abrasive tool operating conditions. In coating tools with Hexanite-A powder it is advisable to provide a base for the coating glass in the form of various oxides which modify the coating. This process is necessary in order to obtain glass with a transitional viscosity within the Hexanite-A stability region (not more than 800 C). It is moreover necessary to obtain a glass of sufficiently high abrasion resistance. These requirements are fully satisfied by lithium and zirconium oxides, which are introduced during the melting of the glass. B.W.

N84-32528 Council for Scientific and Industrial Research, Pretoria (South Africa).
DIAMOND SYNTHESIS FROM VARIOUS GRAPHITES
N. I. Petrova Nov. 1983 6 p Transl. into ENGLISH from Sintez. Mineralov i Eksperim. Issled (USSR), 1981 p 145-147
(CSIR-Trans-1749) Avail: NTIS HC A02

In the study of diamond synthesis, attention at all stages is focused primarily on the role of a metal catalyst-solvent, the presence of which leads to modifications of the thermodynamic and kinetic conditions of the crystallization process. At the same time a study of various types of carbon with a varying ability to graphitize has shown that diamond synthesis under catalytic-system transformation conditions depends essentially on the nature of the original carbonaceous materials, the constitution of chemical bonds and chemical affinity (56, 169). However, until now, despite longstanding experiments concerning diamond crystal synthesis, there are no clear-cut recommendations as to the use of carbonaceous materials in connection with actual technological processes. The present paper is devoted to determining some characteristic features of the crystallization of synthetic diamonds based on graphites with a wide range of physiochemical properties. B.W.

N84-32529 Department of the Air Force, Washington, D.C.
PERFLUOROALKYLETHER SUBSTITUTED PHENYL PHOSPHINES Patent
C. Tamborski, C. E. Snyder, Jr., and J. B. Christian, inventors (to Air Force) Issued 12 Jun. 1984 4 p
(AD-D011122; US-Patent-4,454,349; US-Patent-Appl-SN-418115; US-Patent-Class-568-13) Avail: US Patent & Trademark Office CSCL 07/3

Fluorinated phosphines having the general formula wherein ROR is a perfluoroalkylether group containing at least one ether linkage are useful as antioxidation additives for perfluorinated fluids. GRA

N84-32530*# National Aeronautics and Space Administration. Pasadena Office, Calif.
STABILIZED UNSATURATED POLYESTERS Patent Application
Eberhard Borsig (JPL, California Inst. of Tech., Pasadena) and Otto Vogl, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 6 Jun. 1984 23 p
(Contract NAS7-100)
(NASA-Case-NPO-16103-1; NAS 1.71:NPO-16103-1; US-Patent-Appl-SN-617871) Avail: NTIS HC A02/MF A01 CSCL 11C

An unsaturated polyester, such as propylene glycol-maleic acid-phtatic acid prepolymer dissolved in styrene is interpolymerized with an ultraviolet absorber and/or an antioxidant to form a polymer stable to exposure to the outdoors without degradation by ultraviolet radiation, thermal and/or photooxidation. NASA

N84-32531*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE FRICTION BEHAVIOR OF SEMICONDUCTORS Si AND GaAs IN CONTACT WITH PURE METALS
Hiroshi Mishina [1984] 16 p refs Proposed for presentation at the Intern. Tribology Conf., Tokyo, 8-10 Jul. 1985; sponsored by the Japan Society of Lubrication Engineers
(NASA-TM-83779; E-2228; NAS 1.15:83779) Avail: NTIS HC A02/MF A01 CSCL 11G

The friction behavior of the semiconductors silicon and gallium arsenide in contact with pure metals was studied. Five transition and two nontransition metals, titanium, tantalum, nickel, palladium, platinum, copper, and silver, slid on a single crystal silicon (111) surface. Four metals, indium, nickel, copper and silver, slid on a single crystal gallium arsenide (100) surface. Experiments were conducted in room air and in a vacuum of 10 to the minus 7th power N/sq cm (10 to the minus 9th power torr). The results indicate that the sliding of silicon on the transition metals exhibits relatively higher friction than for the nontransition metals in contact with silicon. There is a clear correlation between friction and Schottky barrier height formed at the metal silicon interface for the transition metals. Transition metals with a higher barrier height on silicon had a lower friction. The same effect of barrier height was found for the friction of gallium arsenide in contact with metals. Author

N84-32532*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL PRESSURE SENSITIVE SILICONE ADHESIVES Patent Application
James L. Leiffer, William E. Stoops, Jr., Terry I. St.Clair, Vernon E. Watkins, Jr., and Thomas P. Kelly, inventors (to NASA) Filed 12 Jan. 1984 8 p Continuation-in-Part of US-Patent-Appl-SN-322320, filed 17 Nov. 1981
(NASA-Case-LAR-13270-1; NAS 1.71:LAR-13270-1; US-Patent-Appl-SN-569536) Avail: NTIS HC A02/MF A01 CSCL 11A

An intermediate molecular weight pressure sensitive silicone adhesive is blended with a silicone system, which generally cures with a catalyst to a rubbery tack-free state, to form a pressure sensitive silicone adhesive which is used for structural or load bearing applications without creeping. The adhesive was formulated to give various degrees of tackiness and loading bearing capabilities. This adhesive was successfully utilized from -45 C to +232 C with the tackiness for a 60/40 (tackifier/cured silicone system) pressure sensitive silicone mixture ranging from slight at -45 C to extremely tacky at 232 C. NASA

N84-32533 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
STRUCTURE OF POLYCRYSTALLINE BORON NITRIDE AS DETERMINED BY ELECTRON MICROSCOPIC THIN SECTIONS
N. F. Borovikov 1983 8 p refs Transl. into ENGLISH from Sverhtverdye Materialy (USSR), no. 4, 1982 p 18-22
(CSIR-Trans-1738) Avail: NTIS HC A02

X-ray phase analysis, density measurements, mechanical strength tests and wearability tests are performed BN(w) on hard polycrystalline boron nitride (HPBN) produced from equal proportions of sphaleritic (BN(sph) and wurtzitic boron nitride at pressures exceeding 40 kbar and temperatures up to 2100 C. Other similar samples are investigated by transmission electron microscopy (TEM) and local diffraction phase analysis morphology and character distribution as a function of their transformation. Investigation of the starting BN particles reveals considerable variation in form and size. The particles are found to be 3-dimensional as well as transparent under the electron beam, which in most cases gives a diffraction pattern correspondng to the [0001] zone Columns of fragments elongated in the <1010> direction are observed within the particles. These particles range from some tens of microns to a few microns in size and the diameter of the elongated fragments from several hundreds to a few tens of microns with the longitudinal dimension being a few microns greater. M.A.C.

N84-32534*# Bowie State Coll., Md.
CHARACTERIZATION OF PHYSIOCHEMICAL PROPERTIES OF

POLYMERIC AND ELECTROCHEMICAL MATERIALS FOR AEROSPACE FLIGHT Annual Report
Michael Rock, Vasanth Kunigahalli, Sher Khan, and Angelie McNair May 1984 24 p refs
(Grant NsG-5009)
(NASA-CR-175258; NAS 1.26:175258) Avail: NTIS HC A02/MF A01 CSCL 11B

Nickel-cadmium rechargeable batteries are a vital and reliable energy storage source for aerospace applications. As the demand for longer life and more reliable space batteries increases, the understanding and solving of cell aging factors and mechanisms become essential. Over the years, many cell designs and manufacturing process changes have been developed and implemented. Cells fabricated with various design features were life cycled in a simulated low-Earth orbit regime. Following the test program, a comprehensive electrochemical analysis of cell components was undertaken to study cell degradation mechanisms. Discharge voltage degradation or voltage plateau has been observed during orbit cycling, but, its cause and explanation have been the subject of much discussion. A Hg/HgO reference electrode was used to monitor the reference versus each electrode potential during the discharge of a cycled cell. The results indicate that the negative electrode was responsible for the voltage plateau. Cell analysis revealed large crystals of cadmium hydroxide on the surface of the negative electrode and throughout the separator. B.W.

N84-32535*# Chem Tronics, Inc., El Cajon, Calif.
RIGID CLOSED-CELL POLYIMIDE FOAMS FOR AIRCRAFT APPLICATIONS AND FOAM-IN-PLACE TECHNOLOGY Final Report, 1 Jul. 1982 - 1 Jul. 1984
J. Gagliani, P. Straub, and J. Gagliani, Jr. [1983] 47 p refs
(Contract NAS9-16657)
(NASA-CR-171805; NAS 1.26:171805) Avail: NTIS HC A03/MF A01 CSCL 11B

Significant accomplishments generated are summarized. Testing of closed cell foams, which has resulted in the characterization of compositions which produce rigid foams for use in galley structure applications is reported. It is shown that the density, compressive strength and shear strength of the foams are directly related to the concentrations of the microballoons. The same properties are also directly related to the resin loading. Prototype samples of rigid closed cell foams meeting the requirements of the program were submitted. Investigation of the apparatus to produce polyimide foams using foam in place techniques, resulted in the selection of a spray gun apparatus, capable to deliver a mixture of microballoons and resin binder on substrates which cures to yield a closed cell foam. It is found that the adhesion of the foam on aluminum, titanium and steel substrates is satisfactory. It is concluded that the material meets the mechanical and thermal requirements of the program. E.A.K.

N84-32536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RF SPUTTERED SILICON AND HAFNIUM NITRIDES AS APPLIED TO 440C STEEL
A. Grill (Ben Gurion Univ. of the Negev, Beer Sheeva, Israel) and P. R. Aron Mar. 1984 28 p refs
(NASA-TM-86862; E-1993; NAS 1.15:86862) Avail: NTIS HC A03/MF A01 CSCL 11D

Silicon nitride and hafnium nitride coatings were deposited on oxidized and unoxidized 440C stainless steel substrates. Sputtering was done in mixtures of argon and nitrogen gases from pressed powder silicon nitride and from hafnium metal targets. The coatings and the interface between the coating and substrate were investigated by X-ray diffractometry, scanning electron microscopy, energy dispersive X-ray analysis and Auger electron spectroscopy. Oxide was found at all interfaces with an interface width of at least 600 A for the oxidized substrates and at least 300 A for the unoxidized substrates. Scratch test results demonstrate that the adhesion of hafnium nitride to both oxidized and unoxidized 440C is superior to that of silicon nitride. Oxidized 440C is found to have increased adhesion, to both nitrides, over that of unoxidized 440C. Coatings of both nitrides deposited at 8 mtorr were found to have increased adhesion to both oxidized and unoxidized 440C over those deposited at 20 mtorr. A.R.H.

N84-32537# Wisconsin Univ., Madison. Dept. of Chemical Engineering.
PROPERTIES OF UV-CURED POLYURETHANE ACRYLATES: EFFECT OF POLYOL TYPE AND MOLECULAR WEIGHT Interim Report
S. B. Lin (Syntex Opthalmics, Inc., Phoenix, Ariz.), S. Y. Tsay (National Cheun Kung Univ., Taiwan), T. A. Speckhard, K. K. S. Hwang (Life Science Sector Lab., St. Paul), J. J. Jezerc, and S. L. Cooper 20 Jun. 1984 47 p Submitted for publication
(Contract N00014-83-K-0423)
(AD-A143176) Avail: NTIS HC A03/MF A01 CSCL 11/9

Several families of UV-cured polyurethane acrylates were synthesized and the effects of polyol type and molecular weight on their physical properties were investigated. Increasing polyol molecular weight led to a lower polyol glass transition temperature, a smaller amount of a separate urethane acrylate phase, and a larger chain length between crosslinks. The first two effects were reflected in lower modulus and strength at room temperature while the larger chain length between crosslinks led to higher elongation at break (room temperature) and lower modulus at high temperatures. The use of different polyols (polycarbonate, polytetramethylene oxide, polypropylene oxide, and polycaprolactone) primarily affected the room temperature modulus due to differences in the position and breadth of the polyol glass transition. The properties of materials based on isocyanatoethyl methacrylate (IEM) and toluene diisocyanate-2-hydroxyethyl methacrylate (TDI-HEMA) were also compared. Author (GRA)

N84-32538# Naval Academy, Annapolis, Md. Dept. of Physics.
ELECTRICALLY CONDUCTING POLY(VINYL ACETATE) Interim Report
J. J. Fontanella, M. C. Wintersgill, J. P. Calame, S. G. Greenbaum (Hunter Coll., N.Y.), and C. G. Andeen (Case Western Reserve Univ., Cleveland) May 1984 14 p
(NR Proj. 627-793)
(AD-A143199; TR-11) Avail: NTIS HC A02/MF A01 CSCL 11/9

Electrically conducting polymers have recently been the subject of intense interest. Polyacetylene has been widely studied as an electronic conductor. Ionic conductors include poly(ethylene oxide), poly(propylene oxide) and poly(ethylene succinate). In the present note, the observation of electrically conducting poly(vinyl acetate) (PVAc) is reported. Ionic conduction is inferred from the date. Author (GRA)

N84-32539# Rockwell International Science Center, Thousand Oaks, Calif.
PROCESSING SCIENCE TO INCREASE THE RELIABILITY OF CERAMICS Final Report, 1 Jun. 1983 - 31 May 1984
F. F. Lange and D. J. Green Jul. 1984 81 p
(Contract N00014-83-C-0469)
(AD-A143207; SC5368.2FR; TR-1; TR-2; TR-3; TR-4) Avail: NTIS HC A05/MF A01 CSCL 11/2

Contents: Sinterability of ZrO2 and Al2O3 Powders The Role of Pore Coordination Number Distribution; Sinterability of Agglomerated Powders; Effect of ZrO2 Inclusions On the Sinterability of Al2O3; and Relations Between Shrinkage Strain, Strain Rate and Rearrangement During Sintering: Experimental Observations with Al2O3, ZrO2 and Al2O3/ZrO2 Powder Compacts. GRA

N84-32540# Wisconsin Univ., Madison. Dept. of Chemical Engineering.
PROPERTIES OF UV-CURABLE POLYURETHANE ACRYLATES: EFFECT OF REACTIVE DILUENT Interim Technical Report
T. A. Speckhard, K. K. S. Hwang, S. B. Lin, S. Y. Tsay, and M. Koshiba 20 Jun. 1984 44 p
(Contract N00014-83-K-0423)
(AD-A143241; AD-E750949; ITR-4) Avail: NTIS HC A03/MF A01 CSCL 11/9

Several families of UV-cured polyurethane acrylates were synthesized and the effects of reactive diluent type and content on their physical properties were investigated. Increasing reactive diluent content promoted the development of a second, high glass transition temperature phase in all the materials, thereby leading to increased strength and modulus. Changes in the extensibility of the samples upon addition of reactive diluent were inversely related to the effect of the diluent on the crosslink density. The effects of using different reactive diluents (di-, tri- and tetra-ethylene glycol diacrylate and N-vinyl pyrrolidone) on the physical properties of the samples were attributed to differences in the softening point of the homopolymer reactive diluents and the relative compatibility of the reactive diluents with the urethane acrylate segments. Author (GRA)

N84-32541# Manchester Univ. (England). Inst. of Science and Technology.
TEXTILE BALLISTIC PERFORMANCE (DATA BASE) Final Technical Report
J. W. S. Hearle, C. M. Leech, and C. R. Cork Jun. 1984 66 p
(Contract DAJA37-82-C-0234; DA Proj. IT1-61102-BH-57)
(AD-A143249) Avail: NTIS HC A04/MF A01 CSCL 11/5

Nylon and Kevlar textiles are examined for their performance against impact by a 1-gram projectile, when subject to impact velocities up to 200 m/s. The textiles are of varying areal density, and of varying layer composition and their performance is examined theoretically and experimentally. The theoretical models have been previously developed and are the characteristics model, membrane finite element and a multilayer finite element; the experimental facility had also been previously established and this report is aimed at correlating the experimental and theoretical facilities and to establish a data base of results. It was quickly found that the theoretical models favored nylon over Kevlar for ballistic performance, whereas experimentally Kevlar is superior. It is also shown that the deformation process is correctly modelled and this then suggests that the fracture criterion must be reconsidered; possible fracture mechanisms to be included in textile failure criterion are stated for future consideration. Author (GRA)

N84-32542# Tel-Aviv Univ. (Israel). Dept. of Chemistry.
DYNAMICS OF LARGE MOLECULES AND MOLECULAR CLUSTERS Final Technical Report
J. Jortner and U. Even Jun. 1984 17 p
(Contract DAJA37-81-C-0196)
(AD-A143386) Avail: NTIS HC A02/MF A01 CSCL 20/4

New techniques for spectroscopy in supersonic expansions have been developed since the initiation of the research program. Examples include: The Construction of a Pulsed, Planar, Supersonic, Slit Nozzle; Absorption Spectroscopy in Supersonic Expansions; Determination of Fluorescence Quantum Yields in Jets; Laser-Free Spectroscopy of Large Molecules in Planar, Supersonic Jets; Medium-Resolution Absorption and Quantum Yield Data in Jets; and Two-Photon Spectroscopy. Some accomplishments since the initiation of the research projects are listed, such as the recording of absorption spectra of ultracold aniline, anthracene, perdeuterated anthracene, and other compounds. GRA

N84-32543# Naval Civil Engineering Lab., Port Hueneme, Calif.
PRELIMINARY GUIDELINES FOR MAINTENANCE OF POLYURETHANE FOAM (PUF) ROOFING SYSTEMS Technical Note Oct. 1978 - Apr. 1983
R. L. Alumbaugh, S. R. Conklin, and D. A. Zarate Mar. 1984 61 p
(Y09-9501; F60-534)
(AD-A143458; NCEL-TN-1691) Avail: NTIS HC A04/MF A01 CSCL 13/13

This report presents details of experiments and preliminary guidelines for maintaining sprayed polyurethane foam (PUF) roofing systems, which have been used in increasing numbers in recent years by government and the private sector. Many of these PUF roofs are now requiring maintenance because of improper materials, improper application, or length of time in service (age). Standard methods and procedures for maintaining and repairing PUF roofs have not yet been developed or used by manufacturers or contractors to any great extent. In general, each contractor has his own special maintenance procedures. A number of experiments have been conducted by NCEL in an investigation to establish effective procedures for maintenance of PUF roofing systems. Author (GRA)

N84-32544# Department of the Air Force, Washington, D.C.
PROTECTED ETHYNYLATED PHENOLS Patent Application
J. S. Wallace and F. E. Arnold, inventors (to Air Force) Filed 21 Mar. 1984 19 p
(AD-D011096; US-Patent-Appl-SN-592033) Avail: NTIS HC A02/MF A01 CSCL 07/3

The present invention is directed to alpha-hydroxyalpha-alkyl-substituted acetylene compounds. A variety of acetylene-terminated resin systems have been prepared and studied in recent years. Acetylene-terminated resins cure through addition rather than condensation, thus avoiding the problem of voids caused primarily by outgassing which occurs during the condensation mechanism cure. GRA

N84-32545# Argonne National Lab., Ill.
CHEMICAL STABILITY OF BETA-ALUMINUM
J. A. Smaga 1984 4 p refs Presented at Intern. Soc. of Electrochem., Berkeley, Calif., 5 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-009635; CONF-840853-1) Avail: NTIS HC A02/MF A01

Two beta-alumina compositions that are used in developmental cells were immersed in molten sodium to differentiate the chemical effects of electrolyte degradation from the electrochemical ones. Tests were also conducted in sodium polysulfide melts because electrolyte deterioration on the sulfur side was also reported. DOE

N84-32546# Utah Univ., Salt Lake City.
EFFECT OF PROCESSING CONDITIONS ON THE RELIABILITY OF CROSSLINKED POLYETHLENE CABLE INSULATION Final Report
Paul J. Phillips Jun. 1984 112 p refs
(Contract DE-AC02-79ER-10421)
(DE84-014902; DOE/ER-10421/5) Avail: NTIS HC A06/MF A01

Morphology of crosslinked branched polyethylenes and component gel and sol fractions were determined. It was shown that increasing crosslink density affects crystallinity, unit cell parameters, heat of fusion, crystal perfection and crystallization kinetics as well as gross morphology. A transition in gross morphology occurs on increasing crosslink density from sheaflike lamellar bundles to oriented lamellar domains. Local stresses due to localized inhomogeneities in crosslink density exert an important influence on morphology. The sol and gel fractions are fundamentally incompatible and separate in a short temperature interval just above the melting point. Annealing studies show major effects on melting curves. It was demonstrated that morphological effects exert a major influence in accelerated electrical aging tests. Major increases in the rates of nucleation and growth of water trees result from annealing processes. Trace amounts of ethylene gylcol (antifreeze) produce increases in treeing also, a tenfold increase in nucleation being observed. These results demonstrate that thermal aging of commercially used material for short periods of time at temperatures between 80 and 110(0)C produce a major decrease in resistance to treeing. Current rating standards do not take into account physical aging effects, considering only oxidation as important. DOE

N84-32547# Sandia Labs., Albuquerque, N. Mex.
PHYSICAL TECHNIQUES FOR PROFILING HETEROGENEOUS POLYMER DEGRADATION
R. L. Clough and K. T. Gillen 1984 20 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013807; SAND-83-2171C) Avail: NTIS HC A02/MF A01

The application of three complementary techniques for the study of oxidative inhomogeneities in degraded polymeric materials is described. Samples are mounted in epoxy, cut in cross section, and polished. Areas of degradation are seen as bands of varying

reflectivity when examined microscopically. Further information on gradient shapes may be obtained by profiling relative material hardness. Additional useful information on gradients in oxygen uptake may be obtained using density gradient columns. These techniques, together with solvent extraction, give consistent results. Heterogeneous effects can exert a major influence on polymer degradation. A striking example occurs with Viton. In the absence of oxygen, the material becomes progressively more cross linked and harder. In the presence of oxygen, the material undergoes scission, and becomes progressively softer. The result is that samples irradiated at high dose rate, where oxidation occurs only near the surface, becomes brittle. Samples irradiated at comparatively lower dose rates, where extensive oxygen permeation occurs, degrade in the opposite way, becoming soft and stretchable. The occurrence of strongly heterogeneous oxidation in samples irradiated at high dose rates is an important consideration in the design of accelerated aging experiments. Even in the absence of oxygen diffusion effects, other heterogeneous mechanisms may significantly impact polymer degradation. An example was given in which the density profiling results showed a material incompatibility problem in which copper poisoning of an ethylene propylene rubber (EPR) cable insulation led to greatly enhanced oxidation adjacent to the copper conductor. DOE

N84-32548# California Univ., Livermore. Lawrence Livermore Lab.
CURE REACTIONS, NETWORK STRUCTURE AND MECHANICAL RESPONSE OF DIAMINODIPHENYL SULFONE CURED TETRAGLYCIDYL 4,4'DIAMINODIPHENYL METHANE
E. T. Mones and R. J. Morgan 11 May 1984 7 p refs Presented at the 188th Meeting of the American Chemical Society, Philadelphia, 26-30 Aug. 1984
(Contract W-7405-eng-48)
(DE84-012607; UCRL-90604; CONF-840805-16) Avail: NTIS HC A02/MF A01

Diaminodiphenyl sulfone (DDS) cured tetraglycidyl 4,4'diaminodiphenyl methane (TGDDM) epoxies are the most common composite matrices utilized in high performance fibrous composites. Results of Fourier transform infrared spectroscopy (FTIR) studies of the cure reactions and network structure of TGDDM-DDS epoxies are reported. DOE

N84-32549# Department of Energy, Washington, D. C.
ELECTRONICALLY CONDUCTIVE CERAMICS FOR HIGH TEMPERATURE OXIDIZING ENVIRONMENTS Patent Application
Gene H. Kucera, James L. Smith, and James W. Sim, inventors (to DOE) Filed 10 Nov. 1983 19 p
(Contract W-31-109-eng-38)
(DE84-014506; US-Patent-Appl-SN-550697) Avail: NTIS HC A02/MF A01

This invention pertains to a high temperature, ceramic composition having electronic conductivity as measured by resistivity below about 500 ohm-cm and chemical stability particularly with respect to cathode conditions in a molten carbonate fuel cell. It is composed of an alkali metal, transition metal oxide containing a dopant metal in the crystalline structure to replace a portion of the alkali metal or transition metal. DOE

N84-32550# Carborundum Co., Niagara Falls, N. Y.
CERAMIC COMPONENT MANUFACTURING TECHNOLOGY DEVELOPMENT Annual Report, Sep. 1982 - Nov. 1983
M. Kasprzyk, I. Ruppel, and J. Halstead 15 Jun. 1984 43 p refs
(PB84-215276; GRI-84/0039) Avail: NTIS HC A03/MF A01 CSCL 11B

Plastic binder extrusion of thin wall small diameter finned and unfinned tubing was developed to the stage that large quantities of tubing can be economically manufactured. Extrusion, binder removal, and sintering conditions were optimized. Larger diameter, thicker wall tubing was successfully plastic extruded at a rapid rate, however, the binder removal and sintering steps are not yet established. GRA

N84-33142# Joint Publications Research Service, Arlington, Va.
SWEDISH RESEARCH IN HIGH-TEMPERATURE CERAMICS, SUPERALLOYS
Ulf Bergmark *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-030) 7 Sep. 1984 p 1-5 Transl. into ENGLISH from NY Tek. (Stockholm), 26 Apr. 1984 p 34-35 (For primary document see N84-33141 22-70)
Avail: NTIS HC A04/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-32551 Department of the Navy, Washington, D. C.
EXPENDABLE INFRARED SOURCE AND METHOD THEREFOR Patent
H. L. Hodgkins, J. K. Reingruber, and K. E. Harwell, inventors (to Navy) Issued 5 Jun. 1984 5 p Supersedes AD-D010389 (AD-D011112; US-Patent-4,452,039; US-Patent-Appl-SN-511351; US-Patent-Class-60-207) Avail: US Patent & Trademark Office CSCL 20/6

This abstract discloses an IR source and method for generating IR radiation whereby a propellant is burned in a first chamber to produce a product gas which is exited through a critical exit. The gas is accelerated to a supersonic velocity by expanding into a second chamber, is passed through a standing shock wave in the chamber to reduce the gas velocity to a subsonic level, is exited through radial orifices into a larger third chamber were the gas is mixed to obtain a substantial uniformity in temperature and specie. The gas is then accelerated by expansion to a chosen subsonic velocity, and is exhausted to the atmosphere. GRA

N84-32552*# Utah Univ., Salt Lake City.
CARBON-13 AND PROTON NUCLEAR MAGNETIC RESONANCE ANALYSIS OF SHALE-DERIVED REFINERY PRODUCTS AND JET FUELS AND OF EXPERIMENTAL REFEREE BROADENED-SPECIFICATION JET FUELS Final Report
Don K. Dalling, Brent K. Bailey, and Ronald J. Pugmire Sep. 1984 98 p refs
(Grant NAG3-27)
(NASA-CR-174761; NAS 1.26:174761) Avail: NTIS HC A05/MF A01 CSCL 21D

A proton and carbon-13 nuclear magnetic resonance (NMR) study was conducted of Ashland shale oil refinery products, experimental referee broadened-specification jet fuels, and of related isoprenoid model compounds. Supercritical fluid chromatography techniques using carbon dioxide were developed on a preparative scale, so that samples could be quantitatively separated into saturates and aromatic fractions for study by NMR. An optimized average parameter treatment was developed, and the NMR results were analyzed in terms of the resulting average parameters; formulation of model mixtures was demonstrated. Application of novel spectroscopic techniques to fuel samples was investigated. Author

N84-32553# Naval Research Lab., Washington, D. C.
LIQUID AND SOLID PHASE COMPOSITIONS IN A PARTIALLY FROZEN jP-5 FUEL LOW IN n-ALKANES Memorandum Report, Apr. 1983 - Jan. 1984
T. L. VanWinkle, R. N. Hazlett, E. J. Beal, and G. W. Mushrush 27 Jun. 1984 19 p
(F65-571)
(AD-A143390; AD-E400961; NRL-MR-5357) Avail: NTIS HC A02/MF A01 CSCL 21/4

A JP-5 low in n-alkanes was partially frozen at several temperatures 9 to 15 C below its normal freezing point of -53 C.

In spite of their low concentrations in the starting fuel, the n-alkanes were the predominant components in the solid phase crystallizing from the fuel. In this respect, this JP-5 behaves in a fashion similar to other jet fuels which contain 3 to 5 times the amounts of n-alkanes. Author (GRA)

N84-32554# Politecnico di Milano (Italy). Ist. di Macchine
NONLINEAR BURNING STABILITY OF SOLID PROPELLANTS Final Technical Report, Jul. 1981 - Dec. 1983
L. DeLuca, G. Riva, and C. Zanotti 31 Dec. 1983 288 p
(Contract DAJA37-81-C-0215; DA Proj. 1T1-61102-BH-57)
(AD-A143573) Avail: NTIS HC A13/MF A01 CSCL 21/9

The nonlinear burning analysis of solid rocket propellants, under development by this research group, was extended to include in particular variable thermal properties and volumetrically distributed chemical reactions in the condensed phase. The theory is restricted to monodimensional combustion waves and thin (i.e., quasi-steady gas phase) heterogeneous flames of thermal nature. Bifurcation diagrams were obtained, predicting the existence of: time-independent steady burning, self-sustained oscillatory steady burning, no steady sustained burning. Several bifurcation parameters were recognized. Static stability boundaries, dynamic stability boundaries, static burning boundaries, pressure deflagration limits were determined for unmetallized AP-based composite propellants. Several thin flame models, available from literature, were properly modified and extended. GRA

N84-32555# Department of the Navy, Washington, D. C.
3,5,5-TRINITRO-3-AZAHEPTANE-1,7-DIOL AND A METHOD OF SYNTHESIS Patent Application
H. G. Adolf, inventor (to Navy) Filed 4 Jun. 1984 15 p
(AD-D011132; US-Patent-Appl-SN-616999) Avail: NTIS HC A02/MF A01 CSCL 07/3

An object of this invention is to provide a new energetic diol which can be used as a component in energetic propellant and explosive binders. A further object of this invention is to provide new polynitrodiols which resist deformulation by mild bases on nucleophiles. Yet another object of this invention is to provide a dissymmetric polynitrodiol which can be used to produce energetic polymers for propellant and explosive binders which have good low temperature properties. These and other objects of this invention are achieved by providing 3,5,5-trinitro-3-azaheptane-1,7-diol. GRA

N84-32556# International Coal Refining Co., Allentown, Pa.
EFFECT OF FEED GAS TRACE COMPONENTS ON THE SRC-1 HYDROGEN PURIFICATION UNIT Final Technical Report
T. C. Li Dec. 1983 79 p refs Prepared in cooperation with Air Products and Chemicals, Inc., Allentown, Pa.
(Contract DE-AC05-78OR-03054)
(DE84-012975; DOE/ER-03054/89) Avail: NTIS HC A05/MF A01

Results of a study of the effects of trace contaminants on the design of the hydrogen purification unit (HPU) for the SRC-I Demonstration Plant are presented. Three types of trace components, unsaturated light hydrocarbons nitrogen oxides, and mercury, were found to be associated with problems that will necessitate modifying the HPU design. Concentrations of the trace components present in the HPU feed were estimated based on gas analyses of the process hydrogen streams. Next, gas/liquid equilibrium and solid solubility correlations for selected trace components in the process streams were developed. The data base was then incorporated into APCI's computer models to be used for evaluation of trace component freeze out. Both acetylene and butadiene should be removed by hydrotreating upstream of the molecular sieve adsorbers. Since nitrogen oxides will react with unsaturated hydrocarbons to produce unstable compounds that can explode, a nitrogen oxide removal step is also required. Adsorption or catalyst reduction of the nitrogen oxides outside the cold box are possible removal methods. An adsorption technology for removing mercury should be included in or upstream of the HPU unit. DOE

N84-32557# Los Alamos Scientific Lab., N. Mex.
REFUELING CONSIDERATIONS FOR LIQUID-HYDROGEN FUELED VEHICLES
W. F. Stewart 9 Dec. 1984 32 p refs Presented at 5th Intersoc. Cryog. Symp., New Orleans, 9 Dec. 1984
(Contract W-7405-eng-36)
(DE84-012623; LA-UR-84-1490; CONF-831219-1) Avail: NTIS HC A03/MF A01

Liquid hydrogen is a possible fuel for transportation applications in the future. Such use of liquid hydrogen will require a refueling station analogous to today's service station for gasoline and diesel fuels. The cryogenic nature of liquid hydrogen and concerns for safety indicate the desirability of a refueling system that is automated as completely as possible and incorporates sufficient redundancy for safe and reliable operation. A refueling system designed on the basis of previous experience with liquid hyrogen transfer systems is developed, built and tested. A series of tests is conducted to determine the extent of the liquid hydrogen losses during a refueling operation and to determine optimum transfer procedures and conditions. M.A.C.

N84-32558# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF THERMAL AGING ON THE OUTPUT OF A PYROTECHNIC ACTUATOR
J. W. Rogers, Jr., K. L. Erickson, and R. W. Bickes, Jr. 1984 13 p refs Presented at the 9th Intern. Pyrotechnics Seminar, Colorado Springs, 6 Aug. 1984
(Contract DE-AC02-76CH-00016)
(DE84-012903; SAND-84-0485C; CONF-840867-2) Avail: NTIS HC A02/MF A01

A thermal aging program with a shock-initiated through-bulkhead actuator (TBA) indicates an enhancement to energy output with age and storage temperature. The TBA and output experiments are described and a possible mechanism that accounts for this phenomenon is presented. DOE

N84-32559# Argonne National Lab., Ill. Energy and Environmental Systems Div.
INVESTIGATION OF THERMAL STABILITY OF FLUORINOL-85 AND 2-METHYLPYRIDINE-WATER AS RANKINE CYCLE POWER SYSTEM WORKING FLUIDS
Mohan L. Jain, Jack Demirgian, and David L. Hillis 1984 4 p Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-006420; CONF-840804-1) Avail: NTIS HC A02/MF A01

The utilization of Fluorinol-85 was effective in Organic Rankine Cycle Power Systems (ORCPS) to a maximum cycle temperature of 550(0)F without any discernable decomposition over an extended period of time was investigated. At 575(0)F, however, Fluorinol-85 could decompose between 1 and 3% per year depending on system design considerations. It is found that 2-methyl-pyridine/water could have possibly less than a 2% annual decomposition rate at 600(0)F maximum cycle temperature. DOE

N84-32560# American Gas Association Labs., Cleveland, Ohio.
HEAT-OF-MIXING EXPERIMENTS FOR LIQUEFIED GASES Annual Report, Nov. 1982 - Oct. 1983
J. A. Zollweg and W. B. Streett Feb. 1984 19 p refs
(PB84-215094; GRI-84/0048) Avail: NTIS HC A02/MF A01 CSCL 21D

Calorimetric measurements of the excess enthalpy in the systems krypton/ oxygen at 80 K are performed in a batch mixing calorimeter. The observed equimolar excess enthalpy for Kr/Xe, (109 + or - 10) J/mol, is significantly larger than had been expected, but the value of N2/O2, (63.2 + or - 1.2) J/mol is in good agreement with other recent measurements. Comparison between earlier excess enthalpy measurements on the system carbon dioxide/ethane and molecular thermodynamics perturbation theory predictions is performed. The use of Kohler mixing rules for the unlike-pair interaction parameters in the perturbation theory gives better agreement with experiment than the traditional Lorentz-Berthelot mixing rules. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-32561 Council for Scientific and Industrial Research, Pretoria (South Africa).
ECONOMIC USE OF CBN GRINDING TOOLS IN THE PRODUCTION OF JET TURBINE COMPONENTS
R. Geisler and D. Hallen 1983 9 p Transl. into ENGLISH from Ind. Diamanten Rundschau (West Germany), v. 15, no. 4, 1981 p 247-249
(CSIR-Trans-1736) Avail: NTIS HC A02/MF A01

The use of cubical boron nitride (CBN) grinding wheels in the production of jet turbine components of superalloys such as Inconel 100, Nimonic 90 or Rene 120 with the acid of an example of guide vane machining for low pressure turbines is described. Cost savings achieved by the use of CBN wheels as compared with conventional grinding wheels and spark erosion are presented in tabular form. R.J.F.

N84-32562 Council for Scientific and Industrial Research, Pretoria (South Africa).
ECONOMICAL GRINDING OF STEEL AND SINTERED CARBIDES USING SUPERHARD ABRASIVES AND HIGH TEMPERATURE-RESISTANT BONDS
H-J. Wiemann and H-R. Meyer 1983 33 p refs Transl. into ENGLISH from Tech. Mitt. (West Germany), v. 288, 1971 p 38-52
(CSIR-Trans-1744) Avail: NTIS HC A03

A cost analysis of the use of Borazon for grinding steel and sintered carbides is given. The hardness of this abrasive lies between that of diamond and boron carbide and, as a result of its chemical behavior in regard to elements with a carbon affinity, it is more suitable than diamond for grinding steel. Furthermore, the grinding of hard-to-machine steels with Borazon is to some extent technologically superior and more profitable than grinding with conventional abrasives. Borazon is manufactured by means of a high pressure-high temperature method, which is similar to the method used for producing synthetic diamond. R.J.F.

N84-32563 Department of the Navy, Washington, D. C.
QUICK DEPLOYMENT VEHICLE (QDV) Patent
A. P. Stevens, J. DeMatteo, and R. M. Beard, inventors (to Navy) Issued 13 Sep. 1983 6 p Supersedes AD-D010241
(AD-D011060; US-Patent-4,404,666; US-Patent-Appl-SN-269171; US-Patent-Class-367-131) Avail: US Patent & Trademark Office CSCL 17/7

A quick deployment vehicle (QDV) for implanting a transponder or beacon on the ocean bottom in an upright position exposed for receiving or transmitting acoustic signals. The vehicle includes a ballistic body of separable fore and aft sections. The fore section includes a core mass for penetrating the ocean sediment, and the aft section includes a beacon for signal transmission. A predetermined interval after impact, as determined by a programmed deceleration profile stored in memory, the sections will separate. The sensed deceleration of the vehicle is compared at predetermined intervals to the stored profile, and when the sensed level is less than the stored level, a squib is fired to separate the two sections. The aft section penetrates and remains exposed above the sediment, while the fore section further penetrates into the ocean bottom. GRA

N84-32564# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
FORTY YEARS OF DEVELOPMENT IN DIAMOND TOOLS
1983 9 p Transl. into ENGLISH from Utensil (Italy), v. 3, no. 4, Jul-Aug. 1981 p 99-101
(CSIR-Trans-1730) Avail: NTIS HC A02/MF A01

The growth of the diamond industry in Western Countries since the First World War is surveyed. The articles described deal specifically with the development of the industrial diamond and diamond tool sector in different countries. All data point to continuing rapid expansion in the diamond tool sector. The West consumes 80 percent of world industrial diamond production. Diamond consumption increased sharply in the U.S. during World War 2. There are 300 diamond manufacturers in the U.S. today. In 1940, there were 25. In Japan, consumption of industrial diamonds has increased several times. In Italy, there has been a 75 fold increase in the production of diamond tools since 1959. S.B.

N84-32565# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
THE RECORD OF ELECTRICAL AND COMMUNICATION ENGINEERING CONVERSAZIONE, VOLUME 53, NO. 1, JUL. 1984
Jul. 1984 49 p refs In JAPANESE; ENGLISH summary
(ISSN-0385-7719) Avail: NTIS HC A04/MF A01

A method for measuring the temperature of semiconductor lasers is described. In addition, the HDLC and X-25 protocols are discussed by using the NESDEL high level language. Finally, a design technique of the hardware algorithms for the recognizer of regular languages is presented. For individual titles, see N84-32566 through N84-32568.

N84-32566# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
A STUDY ON ACCURATE FREQUENCY-CONTROL OF SEMICONDUCTOR LASERS **c36**
Yukio Ohtaguro, Hideaki Sone, Hiroshi Echigo, and Tasuku Takagi *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 53, No. 1, Jul. 1984 Jul. 1984 p 11-14 refs In JAPANESE; ENGLISH summary (For primary document see N84-32565 22-31)
Avail: NTIS HC A03/MF A01

A method for measuring the temperature of semiconductor lasers is described. The characteristics of semiconductor lasers vary according to the temperature, thus it is possible to measure the temperature without using thermo-sensitive devices such as thermistors. By using this method, the output power and temperature of semiconductor lasers are simultaneously controlled by PID feedback to stabilize and to control the radiation frequency. The step response and long term stability of the temperature were measured. Author

N84-32567# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
ON APPLICATIONS OF A SPECIFICATION AND DESCRIPTION LANGUAGE NESDEL TO COMMUNICATION PROTOCOLS **c61**
Kazushi Funada, Kaoru Takahashi, Norio Shiratori, and Shoichi Noguchi *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 53, No. 1, Jul. 1984 Jul. 1984 p 15-28 refs In JAPANESE; ENGLISH summary (For primary document see N84-32565 22-31)
Avail: NTIS HC A03/MF A01

In the recent years there was a sharp increase in costs of software design. A similar situation exists in the software of communication protocols. A solution to this problem is to develop high level languages for describing protocol specification. The language NESDEL is used mainly to specify and describe the logic of a protocol, and is based on a finite state machine approach. The HDLC and X-25 protocols are described herein by using the NESDEL. Through the description of HDLC and X-25, the effectiveness of the NESDEL is demonstrated clearly. Author

N84-32568# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
AN AUTOMATIC SYNTHESES OF HARDWARE ALGORITHM **c61**
Masahiro Aono, Lomton Paisan, Masateru Harao, and Shoichi Noguchi *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 53, No. 1, Jul. 1984 Jul. 1984 p 29-46 refs In JAPANESE; ENGLISH summary (For primary document see N84-32565 22-31)
Avail: NTIS HC A03/MF A01

A design technique of the hardware algorithms for the recognizer of regular languages which has the ability of parallel

computations under the data flow control is described. This recognizer is attainable by the cellular reconfigurable array (CECOA). The proposed method transforms regular expressions into the graph data. Second, it transforms the graph data into intermediate language, and lastly, it transforms the intermediate language into the acceptable data for CECOA. The advantage of this algorithm is that the user has only to input regular expressions, then the recognizer is embedded on the CECOA automatically. In addition to this algorithm, the simulator and the control of the data (token) in this pattern matching machine are mentioned.
Author

N84-32569*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTAINERLESS HIGH PURITY PULLING PROCESS AND APPARATUS FOR GLASS FIBERS Patent Application
Robert J. Naumann and Edwin C. Ethridge, inventors (to NASA) Filed 19 Apr. 1984 13 p
(NASA-Case-MFS-25905-2; NAS 1.71:MFS-25905-2; US-Patent-Appl-SN-601130) Avail: NTIS HC A02/MF A01 CSCL 13H

An apparatus and method for pulling optical glass fibers in a containerless environment is disclosed which includes a single axis acoustic levitation furnace in which a specimen is levitated and melted. A reflector unit is carried in the interior of the furnace and includes a reflector disposed centrally about the acoustic axis of the levitator. A fiber pulling bore is formed centrally in the reflector unit surrounded by cooling jacket to enhance solidification and formation of a fiber. A starting fiber strand is introduced into the melt and pulled outwardly through the bore whereby the specimen fiber is started and formed as pulled therethrough. A movable secondary reflector is provided which captures a supplemental specimen pellet and transfer it to the melt. NASA

N84-32570# Argonne National Lab., Ill. Reactor Analysis and Safety Div.
MODELING OF CONCRETE RESPONSE AT HIGH TEMPERATURE
P. Pfeiffer and A. Marchertas 1984 5 p refs Presented at the 5th Am. Soc. of Civil Engr.-Eng. Mech. Spec. Conf., Laramie, Wyo., 1 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-009587; CONF-840833-5) Avail: NTIS HC A02/MF A01

A rate type creep law is implemented into the computer code TEMP-STRESS for high temperature concrete analysis. The disposition of temperature, pore pressure and moisture for the particular structure in question is provided as input for the thermo-mechanical code. The loss of moisture from concrete also induces material shrinkage which is accounted for in the analytical model. Examples are given to illustrate the numerical results.
DOE

N84-32571# California Univ., Berkeley. Coll. of Engineering.
COMPARISON BETWEEN TWO LYSHOLM ENGINES M.S. Thesis
B. A. Frau 1983 77 p refs
(Contract DE-AT03-80ET-27252)
(DE84-013696; DOE/ET-27252/T4) Avail: NTIS HC A05/MF A01

The Lysholm engine as an expander of two phase geothemal brine was developed. The sizes of the machines, as well as the approaches, are different. Comparisons are made to clarify the direction in which future efforts should be conducted. DOE

N84-32572# Sandia Labs., Albuquerque, N. Mex. Computer Communications Design Div.
OPTICAL FIBER TERMINATION AND SPLICING TECHNIQUES
Michael George and Marc M. Miller Jun. 1984 31 p
(Contract De-AC04-76DP-00789)
(DE84-013919; SAND-84-0972) Avail: NTIS HC A03/MF A01

This report details various techniques that have been developed during the course of optical fiber experimentation and installations. During the development phases, attempts have been made to devise the quickest and least tedious methods in each area of optical fiber work. These procedures include the termination and splicing of various cable types. Also included are appendices containing information on tools, connectors, jumpers, and splicing equipment. DOE

N84-32573# California Univ., Berkeley. College of Engineering.
ALTERING THE VOLUMETRIC EXPANSION RATIO OF A LYSHOLM HELICAL SCREW EXPANDER
M. K. Dunbar 1984 89 p refs
(Contract DE-AT03-80ET-27252)
(DE84-013695; DOE/ET-27252/T3) Avail: NTIS HC A05/MF A01

This is an analysis of the effects of the volumetric expansion ratio on the operating of a Lysholm helical screw expander. Extensive testing of the University of California Lysholm engine with a 5.3 volumetric expansion ratio was performed. The expansion ratio was reduced from 5.3 to 4.0. Tests were performed at a variety of speeds and qualities for a 5.0 pressure ratio and at a variety of speeds and pressure ratios for 99 percent quality. It was predicted that decreasing the volumetric expansion ratio would decrease the leakage fraction and thereby increase efficiency. This occurred as predicted. Isentropic efficiency increased 20 percent for 50 percent quality steam and 16 percent for 33 percent quality steam, all for an inlet pressure of 120 psia and a speed of 9000 rpm. A maximum efficiency of 47.2 percent was reached at 33 percent quality, 9000 rpm and a pressure ratio of 5.0. The leakage rate did not appear to be a function of expansion ratio, was expected. DOE

N84-32574# California Univ., Berkeley. College of Engineering.
EMPIRICAL MODELING OF A LYSHOLM HELICAL SCREW EXPANDER
K. A. Brown 1984 145 p refs
(Contract DE-AT03-80ET-27252)
(DE84-013694; DOE/ET-27252/T8) Avail: NTIS HC A07/MF A01

Testing of a Lysholm helical screw expander having a rotor diameter of 5.12 inches and an expansion ratio of 5.3 was performed with simulated geothermal fluid at an inlet pressure of 120 psia. The inlet quality, engine speed and pressure ratio were independently varied to produce a three-dimensional data matrix of 104 data points. Statistical curve fitting methods were adapted to produce equations for mass flow rate and power output in terms of the three variables associated with the data matrix. These explicit equations were combined with a steam table subroutine to produce a computer model for prediction of mass flow rate, power, efficiency and exhaust quality at a given set of operating conditions. The predictive ability observed during validation of the model is adequate for use in modeling of hybrid geothermal energy conversion systems. Mass flow rates were predicted to within 2.7% of the measured values. For most conditions, predictions of power were within 3.3% of the measured values. Predictions of efficiency reflected the combined errors in prediction of power and mass flow rate. DOE

N84-32575# Solar Turbines International, San Diego, Calif.
HIGH TEMPERATURE METALLIC RECUPERATOR Final Report, Jan. 1980 - Dec. 1983
M. E. Ward and C. E. Smeltzer Nov. 1983 179 p refs
(PB84-207869; SR83-R-4861-45; GRI-84/0012) Avail: NTIS HC A09/MF A01 CSCL 13A

The successful operation in an actual production facility of a high temperature waste heat recovery system preheating combustion air to above 1500 F is described. Operator and facility management satisfaction with the high technology recuperated box-type forge furnace and their support during the field test of this new equipment is discussed. The system shows reliable operation demonstrated fuel savings in the neighborhood of 42%, and the significant increase in product quality and decrease in furnace heat times (increase in furnace productivity). GRA

N84-32576# American Gas Association Labs., Cleveland, Ohio.
ADVANCEMENT OF DEVELOPMENTAL TECHNOLOGY FOR PULSE COMBUSTION APPLICATIONS Annual Report, Jan. 1983 - Feb. 1984
P. S. Vishwanath Mar. 1984 52 p refs
(PB84-215268; GRI-84/0070) Avail: NTIS HC A04/MF A01 CSCL 13A

The major results in the areas of stand alone pulse units mixing and decoupling are presented. A self-starting pulse unit is designed and successfully tested up to an imput rate of 100, 000 Btu/hr. A setup to generate power from puse unit exhaust gases is also put together. In the area of decoupling, major factors affecting design of inlet and exhaust decouplers are identified. Changes in these factors affected burner stability, operating frequency and the phase relationship between burner and decoupler pressures. Frequency scan analysis is used to simulate frequency response of several burner/decoupler combinations. In the area of mixing, a multiple pipe pulse unit is fabricated and used to obtain baseline data on mixer head performance. GRA

N84-32577# Oakland Univ., Rochester, Mich. Dept. of Engineering.
DEVELOPMENT OF SHEAROGRAPHY FOR NONDESTRUCTIVE TESTING OF HIGHWAY STRUCTURE Final Report
Y. Y. Hung and J. D. Hovanesian Washington DOT 1984 33 p (Contract DTRS5681-C-00025)
(PB84-187244; DOT/RSPA/DMA/50-84/17) Avail: NTIS HC A03/MF A01 CSCL 13B

Testing methodologies which may lead to early detection of impending structural failures are developed. The research is aimed at a laboratory feasibility study of an optical technique known as SHEAROGRAPHY for nondestructive testing of highway structural members. Laboratory samples representing typical highway structural members with programmed defects are tested with shearography. These samples include tubular member with an internal crack, butt weld joint with an imperfection in the weld, riveted joint with a loosened rivet, steel reinforced concrete slab with a broken internal reinforcement rod, and cord reinforced composite plate with the delaminations. All the programmed defects are detectable by shearography. GRA

N84-32578# Federal Highway Administration, Washington, D.C. Materials Technology and Chemistry Div.
TIME-TO-CORROSION OF REINFORCING STEEL IN CONCRETE SLABS. VOLUME 5: CALCIUM NITRITE ADMIXTURE OR EPOXY-COATED REINFORCING BARS AS CORROSION PROTECTION SYSTEMS Interim Report, Jul. 1980 - Dec. 1982
Yash Paul Virmani, Kenneth C. Clear, Thomas J. Pasko, Jr., Walter Jones, and David Jones Sep. 1983 80 p refs
(PB84-195239; FHWA/RD-83/012) Avail: NTIS HC A05/MF A01 CSCL 13B

Thirty-one relatively large reinforced concrete slabs are fabricated using either nonspecification epoxy coated reinforcing steel or calcium nitrite admixture with black (uncoated) steel. Their performance is compared with uncoated steel in concrete without admixtures. All the electrical connections between the reinforcing mats are made exterior to the slabs so that the corrosion current flow could be monitored. A worst case type of research design is used by specifying poor quality concrete, nonspecification epoxy coated rebars, and good electrical coupling between the rebar mats. After curing, the slabs are mounted above ground and exposed to the environment of the Washington, D.C. location. Selected slabs are demolished to confirm the findings of the nondestructive testing. GRA

N84-32579# Battelle Pacific Northwest Labs., Richland, Wash.
COMPENDIUM OF SELECTED METHODS FOR SAMPLING AND ANALYSIS AT GEOTHERMAL FACILITIES Summary Report
Cecil H. Kindle, Karl H. Pool, J. Donald Ludwick, and David E. Robertson Jun. 1984 184 p refs
(PB84-199926; EPA-600/4-84-049) Avail: NTIS HC A09/MF A01 CSCL 13B

An independent study of the field has resulted in a compilation of the best methods for sampling, preservation and analysis of potential pollutants from geothermally fueled electric power plants. These methods are selected as the most usable over the range of application commonly experienced in the various geothermal plant sample locations. In addition to plant and well piping, techniques for sampling cooling towers, ambient gases, solids, surface and subsurface waters are described. Emphasis is placed on the use of sampling proves to extract samples from heterogeneous flows. Certain sampling points, constituents and phases of plant operation are more amenable to quality assurance improvement in the emission measurements than others and are so identified. GRA

N84-32580# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING
21 May 1984 72 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UEE-84-006) Avail: NTIS HC A04

Research activity in the area of electronics and electrical engineering in the U.S.S.R. is reviewed. Some areas addressed are: aerospace and electronic systems; antennas and propagation; broadcasting/consumer electronics; circuits and systems; communications; computers; components, hybrids and manufacturing technology; electron devices; and microwave theory and techniques. For individual titles, see N84-32581 through N84-32613.

N84-32581# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF ANTENNAS WITH WEAK SUPERDIRECTIVITY Abstract Only **c32**
I. M. Polishchuk *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 2 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 1900-1906 Original language document previously announced in IAA as A84-12578 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Rigorous relations linking the field distribution in the antenna aperture with the antenna directivity pattern are used to find possible distributions providing for a surface aperture utilization coefficient greater than unity. Such antennas are defined as weakly superdirectional. B.J. (IAA)

N84-32582# Joint Publications Research Service, Arlington, Va.
ANGLE RESOLUTION OF WIDEBAND SIGNALS RECEIVED BY TWO SLIGHTLY DIVERSE LINEAR ANTENNA ARRAYS Abstract Only **c32**
S. T. Bagdasaryan and Ye. P. Zinevich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 2-3 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 1926-1930 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The problem of angle resolution is considered in the case of detection of wideband signals by means of antenna arrays with a discontinuous aperture. The receiver antenna is assumed to be linear and to consist of two separate equidistant arrays of weakly directional elements. The signals are assumed to appear at the receiver on plane electromagnetic waves together with interference and intrinsic noise, both centered stationary Gaussian random processes. Expressions are derived for the energy utilization factor, characterizing the signal to noise interference ratio relative to the signal noise ratio without interference. A comparison of that energy utilization factor corresponding to optimal processing of a narrow band signal and to nonoptimal processing of a wideband signal, respectively, yields the dependence of detectability and angle resolution on the signal bandwidth and the angular spacing of signal sources. Author

N84-32583# Joint Publications Research Service, Arlington, Va.
THERMOSCOPIC STUDY OF DIFFRACTION CURRENT DISTRIBUTION Abstract Only **c32**
A. N. Gorgoshidze and Yu. I. Khvorostyanoy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 3

Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 2057-2060 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The distribution of induced current over the surface of a body is measured with infrared instruments which record the temperature increases resulting from heating in a high frequency electromagnetic field. The principle of this method is based on the theory of heat emission and absorption with diffraction, and on the electromagnetic field theory, taking into account the skin effect and the Joule effect. The recording instruments are designed accordingly, with a black sensor material, and used under conditions where the body surface temperature does not exceed half the equilibrium temperature at which all absorbed electromagnetic energy is reemitted into free space as thermal radiation. The recorded thermal image of the diffraction pattern corresponds to the surface distribution of the electric current amplitude squared. The method is proven on model bodies of elementary shapes such as a sphere, a rectangular strip, and a cone, by means of calibration against other known approximate experimental methods and against exact solutions to corresponding diffraction problems. Author

N84-32584# Joint Publications Research Service, Arlington, Va.
CONCERNING POWER RECOVERED BY RECEIVING ANTENNA FROM INCIDENT FIELD Abstract Only c32
Ya. N. Feld *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 4 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2313-2319 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The problem of the power entering a receiver with a random (not necessarily plane) wave incident to the antenna is considered. The problem previously studied by E. L. Burshteyn and B. Ye. Kinber is reconsidered in order: (1) to establish under which conditions the Burshteyn-Kinber formula is correct for power entering a receiver; (2) to obtain a formula which takes into account the effect of mismatch of the feeder line with the antenna and receiver; (3) to give another, simpler version of the formula; and (4) to evaluate the upper boundary of the power entering the receiver with a given incident field and some additional conditions, and to find the distribution of the antenna field (in a transmission regime), guaranteeing realization of the boundary mentioned. An antenna in the form of a horn with a waveguide transmission line was used in the experiment. Author

N84-32585# Joint Publications Research Service, Arlington, Va.
INTENSITY OF RADIOWAVE SCATTERING ON ANISOTROPIC IRREGULARITIES WITH VARIOUS POSITIONS OF SCATTERING VOLUME ABOUT CAUSTIC ZONE Abstract Only c32
S. A. Namazov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 4 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2320-2329 Original language document previously announced in IAA as A84-20153 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

An expression is obtained in the Born approximation for the intensity of radio wave scattering by magnetically oriented irregularities in the ionosphere in the case of variations of the mean refractive index of the medium. The scattering is assumed to be by arbitrarily oriented anisotropic irregularities in a stratified inhomogeneous medium, and different azimuths of incident as well as scattered waves are considered. A determination is made of the features characterizing foreshortened scattering in the illuminated region and the caustic zone, as well as in the shadow zone. B.J. (IAA)

N84-32586# Joint Publications Research Service, Arlington, Va.
REFLECTION OF ELECTROMAGNETIC WAVES FROM INHOMOGENEOUS MEDIA Abstract Only c32
S. N. Stolyarov and Yu. A. Filatov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 5 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2330-2335 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A method for an approximate analytical calculation of the reflection factor of electromagnetic waves from layers with a variable refractive index of an arbitrary form is proposed. The formulas agree well with the known results of a calculation of the reflection factor for a wide classs of dependences of the refractive indices. It is possible to use the formulas during calculation of the reflection of obliquely incident waves. The methods described can be used to calculate conversion of waves in homogeneous transient media. Author

N84-32587# Joint Publications Research Service, Arlington, Va.
OPTIMUM SYNTHESIS OF STEPPED SECOND CLASS PHASE-SHIFTERS Abstract Only c33
V. P. Meshchanov, I. V. Metelnikova, and L. G. Fokeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 5 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2341-2346 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A structure for the electrical circuits of phase shifters is investigated. The object of this is to obtain an optimum synthesis of stepped second class phase shifters. The base of the new structure is a cascade connection of lengths of connected and nonconnected lines, the length of which varies. The coupling coefficients of the lengths of connected lines are identical and the overall number of lengths of connected and nonconnected lines is always odd. An evaluation is made of the results obtained, tables of the parameters are presented, and a classification of stepped phase shifters is introduced. Author

N84-32588# Joint Publications Research Service, Arlington, Va.
RELATIONS BETWEEN ALGORITHMS OF ADAPTIVE OPTIMIZATION OF ANTENNA ARRAYS AND ALGORITHMS OF OPTIMUM DETECTION OF MULTIDIMENSIONAL STOCHASTIC SIGNAL Abstract Only c32
V. G. Gusev and Ye. V. Cherenkova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 6 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2366-2372 Original language document previously announced as A84-20159 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The transfer vector function of a multidimensional filter which processes information from the outputs of antenna array elements is synthesized. Results are presented for three processing efficiency criteria of practical importance, and the relationship between these criteria and an algorithm for the optimal detection of multidimensional stochastic signals is established. Particular consideration is given to the problem of designing multiple tap delay lines (nonrecursive discrete filters) on which the multidimensional filter is based. B.J. (IAA)

N84-32589# Joint Publications Research Service, Arlington, Va.
AUTOCORRELATION RECEIVER FOR DOPPLER SHORT-RANGE RADAR SYSTEMS Abstract Only c32
V. L. Kryzhanovskiy and Ya. I. Stefanishin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 6 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 12, Dec. 1983 p 26-30 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

An autocorrelation Doppler frequency receiver is theoretically and experimentally investigated. It is shown that the structure of a Doppler frequency meter of the autocorrelation type makes it possible to decrease the required signal to noise ratio at the input of the meter to 2.5 to 3. In this case the optimum ratio of the levels of operation of the two shapers, with the probabilities of false alarms and the admission of a signal equal to 0.01;U2/U1 = 2.5. Such an autocorrelator makes it possible to exclude inaccurate measurement of the frequencies of the Doppler signal

and to increase the minimum range of the equipment of short range radar. Author

N84-32590# Joint Publications Research Service, Arlington, Va.
THRESHOLD SIGNALS FOR DETECTOR HAVING STABILIZATION OF FALSE ALARM PROBABILITY Abstract Only c32
A. D. Pluzhnikov and V. V. Savchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 7 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 12, Dec. 1983 p 53-55 Original language document previously announced in IAA as A84-19721 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

It is shown that automatic gain control can be used to stabilize false-alarm probability in the case of the detection of radar signals masked not only by noise of unknown or variable intensity but also by pulsed noise. It is possible to obtain a detection quality which is close to that attained when the same problem is solved by means of rigid amplitude limitations. B.J. (IAA)

N84-32591# Joint Publications Research Service, Arlington, Va.
ADAPTIVE ANALOG-TO-DIGITAL CONVERTER c33
Ye. L. Kon, N. N. Matushkin, and A. A. Yuzhakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 8-12 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 27, no. 1, 1984 p 52-56 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A method is proposed for constructing an adaptive analog-to-digital converter (AA/DC). It was demonstrated that the use of such an AA/DC reduces significantly the redundance of measurement information and increases the accuracy of conversion. The synthesis of an adaptive analog-to-digital converter (AA/DC) with a series-parallel operating algorithm is discussed, and the proposed type of AA/DC is analyzed according to an optimization criterion. R.S.F.

N84-32592# Joint Publications Research Service, Arlington, Va.
LIGHT-EMITTING DIODE MATRIX FLAT SCREEN Abstract Only c33
N. P. Ionov, B. V. Kazakov, V. V. Leonov, and M. N. Platonov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 17 Transl. into ENGLISH from Tekhn. Kino i Televideniya (Moscow), no. 11, Nov. 1983 p 47-48 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The block diagram and operating principles of a light emitting diode matrix flat screen are considered. Among the items included in the diagram are: (1) an analog-to-digital converter; (2) programmed constant storage; (3) series-parallel register; (4) parallel register; (5) current generator; (6) generator of gradiation pulses; and (7) generator of cloth frequency. In order to check the devices experimentally, a model was prepared with a flat matrix screen with 64 x 64 elements and a spacing between elements of 600 microns. The matrix of the light emitting diode 32 x 32 was produced according to planar-epitaxial technology on the basis of a special epitaxial structure of arsenide-phosphide of gallium. The area of the radiating element (light emitting diode) is .0004 sq cm. Author

N84-32593# Joint Publications Research Service, Arlington, Va.
ESTIMATION OF SENSITIVITY THRESHOLD IN INTEGRATING ANALOG-TO-DIGITAL CONVERTERS WITH AVERAGING OF READINGS Abstract Only c33
A. I. Fedonin and A. B. Andreyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 19 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 48-50 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The minimum sensitivity threshold in integrating analog-to-digital converters with modulation of the input voltage and averaging of the output is characterized by the mean square deviation of the output signal and thus determined by its dispersion. Estimation of this threshold takes into account its dependence on the duration T of an individual integration cycle and on the number n of averaged readings. The estimate is based on the noise characteristics of the operational amplifier, with its noise consisting of a white component with spectral density S sub 0 and a flicker component coupled to the latter at some frequency F sub o, as well as on the amplitude-frequency characteristic of the converter with zeros at multiples m/nT of the complete-integration-cycle frequency and with successive peaks of amplitudes decreasing in the ratio 0.64(2m - 1) at frequencies (2m - 1)/2T. Author

N84-32594# Joint Publications Research Service, Arlington, Va.
INDUCTIVE TRANSDUCER FOR DISPLACEMENT-TO-FREQUENCY CONVERSION Abstract Only c33
V. K. Shakurskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 20 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 66-69 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A controllable three-frequency oscillator is usable as a displacement-frequency converter. Controlling such an oscillator is possible by means of nondifferential, parametric displacement transducer whose inductance forms part of the tank circuit of a tunable first amplifier (frequency F sub 10), a mixer, a tuned second amplifier (frequency F sub 20), and another mixer whose output is connected directly back to the input of the first amplifier. The other inputs of both mixers are connected to and receive signals from a quartz oscillator (frequency F sub 3). With the transducer inductance set within the middle of its range, the converter is adjusted so that F sub 10 + F sub 20 is approximately equal to F sub 3. When both amplifiers have sufficient gain to satisfy the condition of amplitude balance, then self-excited oscillations occur in the converter with frequencies F sub 1 at the output of the first amplifier and F sub 2 at the output of the second amplifier, F sub 1 + F sub 2 = F sub 3. A transducer which ensures a frequency-displacement characteristic F sub 10 (0) such that, where both frequencies F sub 1 and F sub 2 as well as thier difference are linear functions of the displacement o, was designed. The transdcuer is connected into the tank circuit of the first (transistor) amplifier. The nonlinearity of its inductance-displacement characteristic is variable. Author

N84-32595# Joint Publications Research Service, Arlington, Va.
SIMULATOR-PROBE FOR DIAGNOSTIC TESTING OF SHORT-WAVE RADIO CHANNELS Abstract Only c32
Yu. M. Gasparyan, R. M. Movsesyan, M. G. Oganesyan, G. A. Poliyevskiy, and P. A. Shirinyan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 24-25 Transl. into ENGLISH from Prom. Armenii (Yerevan, USSR), no. 10, Oct. 1983 p 20-22 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Introduction of channel multiplexing equipment into short-wave radio channels requires prior diagnostic testing of these radio channels. A probe was developed predistorts the discrete signal in conformance with the characteristics of the channel multiplexing equipment. The simulator-probe generates equences of video pulses with + or - 20 V and + or - 9 V amplitudes respectively. This probe is capable of estimating the corrective capability of a tested radio channel with regenerator and channel inspection with a ring-type phase indicator. The probe includes a pulse generator and its output signals are transmitted to two channels. A wobbling device connected through a switch simulates swinging shift of the regenerated signal. Constant-bias and random-bias distortions are simulated by a rise-time and fall-time discriminator. A switch directs the output pulses of this discriminator to a random-bias module. Phase matching of the internal channel signal and the external predistorted signal is effected by means of a cycle phasing device. The ring-type indicator reads the phase after it is synchronized. The entire probe is built with a high degree of circuit integration using series K155 microchips. Experimental operation of its first prototype that it is a convenient and very reliable devices. Author

N84-32596# Joint Publications Research Service, Arlington, Va.
PECULIARITIES IN CONSTRUCTION OF OPTICAL RECEIVERS FOR DIGITAL FIBER-OPTIC COMMUNICATION LINES Abstract Only **c74**
O. B. Pismerov and I. M. Derevyannykh *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 25-26 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 63-66 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Optical receivers for fiber-optic communication lines in a radial network require booster amplifiers for signals which usually do not exceed 5 mV after preamplification. They are ac amplifiers with a clamped output level, automatic gain control, and a peak detector. This simple version is adequate for unidirectional lines with few branches. A booster amplifier for operation in a multistation with with bidirectional lines, busbar structure, and time division of channels requires a high speed peak detector which must be cleared after passage of the message carrying pulse packet. This is done by means of a precisely matched transistor pair able to generate a clearing pulse over a wide range of temperatures. For linear conversion (d/dt) of the preamplifier output signal it is expedient to replace the automatic gain control with a symmetric limiter amplifier followed by a set of pulse rise time and pulse fall time discriminators in parallel, which respectively feed the R input and the S input of a trigger, The sensitivity and the dynamic range of such optical receivers before somewhat worse as their complexity increases. M.A.C.

N84-32597# Joint Publications Research Service, Arlington, Va.
RANDOM SIGNAL RECOGNITION BASED ON SPECTRAL MOMENTS Abstract Only **c32**
B. A. Atayants and V. S. Parshin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 12, Dec. 1983 p 55-57 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

During recognition of stationary noise signals, estimates of the spectral density of power are used as initial tests. These estimates are obtained at frequencies, multiples of K/N, with the assistance of a discrete or rapid Fourier transform. An expression is derived which makes it possible in a first approximation to consider the statistically independent evaluation of the spectrum of frequencies. Evaluations of the probability of errors of recognition P(osh) with various durations of the signals recognized are presented in a table. As calculations and modelling on a computer show, during recognition of narrow band noise signals differing by the central frequency or the spectrum width, R(osh) does not differ from P(osh) M.A.C.

N84-32598# Joint Publications Research Service, Arlington, Va.
INTERRELATION BETWEEN PARAMETERS OF M-TYPE TRAVELING WAVE TUBE Abstract Only **c33**
V. F. Ivoylov and A. S. Chernyshev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 38 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 1986-1992 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Interrelations between the main performance parameters of an M type traveling wave tube are established on the basis of fundamental relations in the theory of such devices. The most common device with a long Caino gun forming a laminar electron beam and with a rectangular helix or meander retarding system is considered. Expressions are derived describing the efficiency and the output power as functions of the supply voltage, both limited by the maximum allowable electron beam thickness and by the condition of synchronism. An interrelation between maximum efficiency and maximum output power is established, under each of these limiting constraints. An interrelation is also established between efficiency and bandwidth under the constraint of maximum allowable asynchronism between a high frequency field and an electron beam. These relations indicate that raising the efficiency, for optimum performance of the output amplfier, is only possible by decreasing the bandwidth and the output power. M.A.C.

N84-32599# Joint Publications Research Service, Arlington, Va.
FREQUENCY CONVERSION IN PHOTOMULTIPLIER DURING INTERACTION OF PHOTOELECTRON BEAM AND ELECTRIC FIELD IN HETERODYNE Abstract Only **c33**
V. A. Dianova, Ye. R. Mustel, V. N. Parygin, and V. I. Bezruchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 39 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 2047-2051 Original language document previously announced in IAA as A84-12596 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

An analysis is made of the conversion of the modulation frequency of optical radiation in a photomultiplier tube during the interaction of the photoelectron flux with the heterodyne field in a wide range of flight angles and for an arbitrary heterodyne signal. Computer calculations of the dependence of the difference-frequency current component on the system parameters are presented. It is shown that, in general, a receiving system based on a photomultiplier tube with an additional grid is characterized by two processes: current cutoff and density bunching of the photoelectron flux. The current cutoff predominates at small angles of flight. (IAA)

N84-32600# Joint Publications Research Service, Arlington, Va.
HIGH-SPEED THYRISTORS ON WEAKLY DOPED GaAs Abstract Only **c76**
S. Gaybullayev, A. B. Gappoyev, V. G. Danilchenko, V. I. Korolkov, V. G. Nikitin, and A. V. Fozhkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 40 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 2052-2056 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A study of GaAs thyristors with a thick weakly doped n(o)-base layer and a thin p base layer yielded their static characteristics and the distribution of excess charge carriers in the n(o)-base. This distribution indicates a strong effect of intrinsic recombination radiation on modulation of the conductivity of that n(o)-base region in the ON state. Anomalies of four layer structures on wideband materials are investigated. Other measurements included dependence of the effective length of the diffusion path for excess charge carriers on the current density in p type and n type weakly doped GaAs specimens, dependence of the current buildup time on the anode voltage at a typical control current of 200 A/sq cm, and dependence of the turn off time on the current density. The results indicate the feasibility of producing GaAs thyristors for switching voltages up to 2 kV and commuting currents of 15 A in 15 to 20 ns, by reducing the impurity concentration and increasing the thickness of both base layers. M.A.C.

N84-32601# Joint Publications Research Service, Arlington, Va.
IMAGE IDENTIFICATION BY METHOD OF INTEGRAL FLUCTUATIONS Abstract Only **c74**
A. Ye. Gorodetskiy, P. P. Kuzmin, and I. L. Tarasova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 40-41 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 70-74 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Harmonic analysis of integral fluctuations is considered as a method of image identification more economical, in terms of computer time and capacity, than the method of boundary inequalities and the correlational method in the case of a very large number of images. For analyzing the integral fluctuations of image intersections, an identifiable image with contour lambda(x) is multiplied n times by an information carrier with a period H and n times by an information carrier with a period h. The optimum resolving procedure consists of harmonic analysis of U, comparing

each harmonic component with a reference. The equipment for implementing this procedure includes a projection screen, a readout device with an objective, a memory, and two multipliers. Each multiplier records the image of a moving information carrier tape. A photoreceiver measures the amount of light passing through the carrier tapes, this amount being proportional to the image intersection area. The photoreceiver feeds data to a power spectrum analyzer, calculates the constant component and the alternating component of the signal power spectrum, then transmits their values to a comparator where they are compared with those of the reference spectrum. The method has been found to be fast and reliable, requiring only one shift of an image. M.A.C.

N84-32602# Joint Publications Research Service, Arlington, Va.
JOSEPHSON POINT CONTACTS NOISE PROPERTIES AT MICROWAVE Abstract Only **c76**
A. N. Vystavkin, V. N. Gubankov, V. P. Dyakov, and M. A. Tarasov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 42 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2457-2459 Original language document previously announced in IAA as A84-20170 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

An experimental investigation of the noise properties of Josephson point contacts at a frequency of 8.6 GHz is carried out. The choice of this high frequency is explained, on the one hand, by the possibility of extending the intermediate-frequency-amplifier band above 1 GHz (thus raising the fluctuation sensitivity of superheterodyne radiometers based on the Josephson effect) and, on the other hand, by the existence of sensitive amplifiers (masers and parametric amplifiers) in the microwave range. The voltage range is indicated in the case of which the main contribution to noise is made by intrinsic Josephson oscillation of the contact. At U greater than 1mV, fluctuations increase with increasing voltage on the contact. B.J. (IAA)

N84-32603# Joint Publications Research Service, Arlington, Va.
UTILIZATION OF NONLINEAR PROPERTIES OF IMPATT-DIODES IN MICROWAVE DEVICES (SURVEY) Abstract Only **c33**
S. M. Dyachenko, S. A. Zinchenko, B. A. Kotserzhinskiy, and V. P. Taranenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 43 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radiotekhn. (Kiev), v. 26, no. 10, Oct. 1983 p 4-18 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Applications for IMPATT diodes with utilization of their nonlinear properties in microwave devices are reviewed from the standpoint of design and performance. The three major applications are harmonic oscillators, frequency multipliers and frequency converters. Power and frequency ratings of those devices using IMPATT diodes as well as particular characteristics such as conversion efficiency, bandwidth, i-f power and dc power, based on Soviet and foreign manufacturers' data, are compared with those of corresponding devices on Gunn-effect or Schottky-barrier diodes. The survey indicates that microwave devices with IMPATT diodes have the highest efficiency, source devices being the principal available power sources at frequencies above 200 GHz, and that a waveguide construction of microwave devices is the preferable one. The performance of harmonic oscillators with IMPATT diodes can be optimized by selecting the electron transit frequency equal to the output harmonic frequency and adding a tunable idle fundamental frequency resonator, the stability of harmonic oscillations being raised by synchronization of the fundamental frequency oscillations. Frequency multiplication requires high-power low-noise IMPATT diodes with high stability, as a replacement for varactors, with a nonresonant capacitive load for ensuring high conversion efficiency. Author

N84-32604# Joint Publications Research Service, Arlington, Va.
SUPERCONDUCTIVE FILMS IN MICROWAVE MICROELECTRONICS (SURVEY) Abstract Only **c33**
O. G. Vendik and A. B. Kozyrev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 44 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 18-28 Original language document previously announced in IAA as A84-14914 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The properties of superconducting microstrip lines and of devices based on such lines are examined. An analysis is made of the characteristics of superconducting microwave filters having low losses in the passband and high rectangularity of the amplitude-frequency response characteristics. The possibility of constructing control and limiting elements on the basis of superconducting films is investigated. Consideration is given to the parameters of broadband and selective microwave switches and limiters which operate by switching the film from the superconducting state to the normal one and vice versa. Attention is also given to prosects for use of Josephson elements for the construction of low-noise detectors, mixers, and amplifiers in the microwave range. B.J. (IAA)

N84-32605# Joint Publications Research Service, Arlington, Va.
INTERMODULATION DISTORTIONS IN SEMICONDUCTOR MICROWAVE RECEIVERS AND TRANSMITTERS (SURVEY) Abstract Only **c76**
Yu. L. Khotuntsev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 44-45 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 28-38 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Signal distortion by intermodulation in semiconductor microwave receivers and transmitters is reviewed from the standpoint of its analysis and suppression. Description of a nonlinear current-voltage characteristic by polynomials and analysis of the interaction between signal voltage and device nonlinearity on this basis reveal harmonic and difference-frequency components of intermodulation. In addition to the basic Volterra-Wiener method with supplemental stability analysis for also covering subharmonics as well as hysteresis and memory effects, other methods such as the harmonic-balance method, the nonlinear-current method, and recurrence relations were used for determining the intermodulation components in receiver and transmitter amplifiers, mixers, and frequency converters. Amplifiers using bipolar transistor or field-effect transistors with Schottky barrier and amplifiers using IMPATT diodes or Gunn-effect diodes were analyzed for intermodulation distortion. Known circuital methods of intermodulation suppression include operating along the least nonlinear ranges of device characteristics or with special-purpose devices such as field-effect transistors with an exponential channel doping profile and lowering the oscillation amplitude, matching the impedances at parasitic frequencies with those at operating frequency, and compensating by predistortion, feedback, automatic control, or addition or feed forward amplifiers. R.J.F.

N84-32606# Joint Publications Research Service, Arlington, Va.
APPROXIMATION MODELS FOR ELECTRODYNAMIC SYSTEMS IN SOLID STATE MILLIMETRIC WAVE DEVICES Abstract Only **c76**
B. A. Kotserzhinskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 45 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 38-45 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

Design and performance calculations for solid-state millimetric-wave devices are generally based on mathematical models, especially crucial being those which describe the electrodynamic system. The unwieldiness of exact models in both form and content, with special functions and infinite series in systems of many equations, made it necessary to develop simpler approximate models without loss of adequacy. Typical of such models are those for describing waveguide-and-pin structures, with algorithms constructed and programmed for computer-aided verification of

their accuracy and adequacy. The simplest model of such an electrodynamic structure is a short-circuited segment of a rectangular waveguide and a thin metal pin inside with clearance for accommodating the active element. Calculation of the input impedance becomes more difficult as the pin thickness increases and he electric field in the gap ceases to be uniform so that further approximation is required. The concept of equivalent T-networks was found to be satisfactory and was extended to electrodynamic structures containing one pin with two gaps and those containing two symmetric pins with identical gaps or two pins with asymmetric identical gaps. In addition, a four-arm model is used for waveguide-coaxial structures and a heuristic thick pin model is used for coaxial-waveguide structures. R.J.F.

N84-32607# Joint Publications Research Service, Arlington, Va.
MILLIMETRIC WAVE FREQUENCY CONVERTER USING GUNN-EFFECT DIODE Abstract Only c76
A. F. Radchenko and I. V. Malyshev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 46 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 45-51 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The frequency conversion characteristics of Gunn-effect diodes operating in the negative-conductance mode in the millimetric-wave range are calculated in the small-signal approximation on the basis of two phenomenological equations, one for the mean energy of random electron motion and one for the mean electron drift velocity. The mixer is represented by an equivalent circuit, assuming a uniform frequency characteristic and a nearly linear phase characteristic of the active diode element with its pass bands limited by ideal filters. An experimental study was made, its resulting confirming the results of theoretical analysis. A microwave oscillator with a Gunn-effect diode was used as the heterodyne, with the frequency varied from 26 to 38 GHz and the power regulated by means of an attenuator before being transmitted through a ferrite diode, a circulator, d a waveguide switch to the mixer. A standard oscillator with calibrated output served as the source of signal power and the latter was transmitted to the mixer through a calibrating attenuator and a directional coupler. Diodes with high doping level and diodes with low doping level were found to behave differently, in terms of the conversion efficiency as a function of the heterodyne power, the maximum conversion efficiency being higher and occurring at a lower heterodyne power in the latter case. Author

N84-32608# Joint Publications Research Service, Arlington, Va.
DESIGN OF LOCKED MICROWAVE OSCILLATORS ON BASIS OF SCATTERING PARAMETERS OF TRANSISTORS OPERATING IN LARGE SIGNAL MODE Abstract Only c33
G. V. Petrov and A. V. Khramov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 46-47 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 51-55 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A method of designing microwave oscillators with external locking is proposed which utilizes not the admittance Y-parameters but the scattering S-parameters of a transistor operating in the large-signal mode. It is based on using an active element with a strong internal feedback, such as KT640 transistor, assuming that only the (S sub 21) parameter depends on the transistor input power and assuming a sufficiently narrow locking band so that the frequency dependence of the S-parameters can be disregarded. The performance of such an oscillator is calculated on this basis, an oscillator with a lossless output matching L-network being considered as a specific example. The results indicate that this method is reliable for transistors operating within a range of small nonlinearity. It can be extended to oscillators with external feedback, but then the frequency dependence of the S-parameters must be taken into account. Author

N84-32609# Joint Publications Research Service, Arlington, Va.
CORRELATIONAL ESTIMATION OF PARAMETERS OF SOLID STATE MICROWAVE DEVICES Abstract Only c33
I. V. Lebedev, A. S. Shnitnikov, and Yu. S. Solodov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 47 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 55-59 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A method is proposed for determining the true variance of parameters of a solid-state microwave device under unfavorable conditions of quality control. This information is needed in development, production, and application of the device, not only because it reveals deficiencies in the design model and in the technological process but also because it is often buried by the complexity of the test equipment and submerged in the sometimes even larger measurement error. The method of estimating the manufacturing variance is a statistical one, a given parameter which characterizes a product lot being sought in the form of a useful signal submerged in interference from all possible distorting factors. Signal and interference are each assumed to be independent random processes, and the resultant dispersion of actual readings is treated as a superposition of both. The standard deviation is determined, accordingly, with use of the correlation coefficient and the confidence range of the latter as well as the adequacy of the sample size are checked against the 3 sigma criterion. Author

N84-32610# Joint Publications Research Service, Arlington, Va.
MODULATION OF MICROWAVE POWER WITH ELECTRON TRANSFER DIODES Abstract Only c33
V. F. Kolomoytsev, V. Ya. Krys, and I. I. Sokolovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 48-49 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 75-77 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

An experimental study was made of a microwave amplitude modulator using AA 703B electron-transfer diodes, the object being to determine its performance characteristics and the mechanisms on which they depend. The test equipment included a microwave oscillator transmitting continuous signals through a rectifier, an attenuator, a frequency meter, a circulator, and a double-throw switch to either of two modulator cells. Modulated signals were either reflected through one circular arm, another rectifier, a directional coupler, and a high-precision attenuator to an oscillograph, or transmitted through the other circulator arm and a wideband detector to a millimeter. A modulator cell consisted of a rectangular waveguide segment 23 x 3.5 sq mm in cross section with a Gunn-effect diode inside and three tuning screws inserted through holes in one of the wide walls. Measurements over the 9.95-10.08 GHz operating frequency range have revealed an increase of the modulation factor with increasing microwave signal power at a constant microwave signal power. B.W.

N84-32611# Joint Publications Research Service, Arlington, Va.
STABLE ASYNCHRONOUS TWO-FREQUENCY OSCILLATIONS IN GUNN-EFFECT DIODE WITH OPEN RESONATOR STRUCTURE Abstract Only c76
A. M. Fursov, B. M. Bulgakov, and A. I. Fisun *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 49 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, No. 10, Oct. 1983 p 80-82 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

A two-frequency millimetric-wave oscillator using a Gunn-effect diode and an open resonator structure is designed for independent tuning of both frequencies and for ensuring a stable difference between them. The compound resonator is formed by two identical spherical mirrors (diameter 90 mm, radius of curvature 150 mm) and an echelette reflector (step height = step width = 4 mm, glare angle 45 deg), which actually form two coupled partial resonators. The diode is located directly in the resonator space in the center recess of the echelette so as to allow direct interaction

of both partial fields and the active element, oriented at 45 deg to the echelette for symmetric loading of both partial resonators. Each frequency is regulated by changing the distance of the corresponding mirror from the diode on the echelette. The total power at both frequencies is lower than the power of single-frequency oscillation. Author

N84-32612# Joint Publications Research Service, Arlington, Va.
INTERMODULATION IN PROTECTIVE SEMICONDUCTOR MICROWAVE DEVICES Abstract Only **c76**
A. I. Ropiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 50 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 92-94 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

For protection of low-noise microwave input amplifiers with low power stability one commonly uses semiconductor devices with limiting diodes in the output stages. These diodes can, however, distort the spectrum of low-power signals in a receiver. This distortion, of the intermodulation kind, results from interaction of signal and interference at the output of a diode state. The power of third-order intermodulation components was measured, for design optimization purposes, using diodes of two sizes with the base layer 4 micron and 20 micron, respectively. In one experiment a diode was connected into a microstrip line in the low-pass filter configuration with transmission losses not exceeding 0.6 dB over 66% of the frequency band. This variant was tested in the decimetric-wave range. In another experiment a diode was connected into a rectangular waveguide of 10x23 sq mm cross section through a coaxial quater-wavelength transformer segment with transmission losses not exceeding 0.8 dB over 6% of the frequency band. This variant was tested in the centrimetric-wave range. According to the results of measurements, the dependence of the third-order intermodulation power on input power in either case with diodes of either size can be approximated as a linear one, with a slope of about 1:3. B. W.

N84-32613# Joint Publications Research Service, Arlington, Va.
EVALUATION OF THE LIMITING ACCURACY IN DETERMINING THE COORDINATES OF A POINT LIGHT SOURCE BY A TELEVISION TRACKING SYSTEM USING AN IMAGE DISSECTOR WITH THE PRESENCE OF A NONSTATIONARY CURRENT COMPONENT **c74**
V. I. Tislenko and Yu. V. Martyshevskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 52-58 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 27, no. 1, 1984 p 29-34 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

The problem of evaluating the potential accuracy of determining the coordinates of a point light source by a television tracking system using an image dissector is solved on the basis of the method of the Markov nonlinear theory of filtration. The results obtained take into account the effect of a nonstationary component of the dissector current and are correct over a wide range of contrast values. Author

N84-32637*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INVESTIGATION AND REHABILITATION TO EXTEND SERVICE LIFE OF DSS-13 ANTENNA CONCRETE FOUNDATION
A. A. Riewe, Jr. *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 160-171 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 13B

N84-32695*# Aerospace Corp., El Segundo, Calif.
DC WIRING SYSTEM GROUNDING AND GROUND FAULT PROTECTION ISSUES FOR CENTRAL STATION PHOTOVOLTAIC POWER PLANTS
Edward J. Simburger *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 169-180 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 13B

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-32614 British Broadcasting Corp., Kingswood (England). Engineering Div.
A TRANSPORTABLE SATELLITE EARTH STATION
M. W. Harman and C. Gandy Jul. 1984 19 p refs (BBC-RD-1984/8) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The main factors that were taken into account in establishing the design of a transportable transmitting Earth station for relaying television signals via a satellite are described. The realization of a practical system to work with the Orbital Test Satellite (OTS) and the European Communications Satellite (ECS) is outlined together with details of the link power budget and results of the performance achieved. A brief review of operational experience by the Television Service up to the time of writing is also included. Author

N84-32615 British Broadcasting Corp., Kingswood (England). Engineering Div.
VIDEO NOISE REDUCTION
J. O. Drewery, R. Storey, and N. E. Tanton Jul. 1984 53 p refs (BBC-RD-1984/7) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A video noise and film grain reducer is described which is based on a first-order recursive temporal filter. Filtering of moving detail is avoided by inhibiting recursion in response to the amount of motion in a picture. Motion detection is based on the point-by-point power of the picture difference signal coupled with a knowledge of the noise statistics. A control system measures the noise power and adjusts the working point of the motion detector accordingly. A field trial of a manual version of the equipment at Television Center indicated that a worthwhile improvement in the quality of noisy or grainy pictures received by the viewer could be obtained. Subsequent trials of the automated version confirmed that the improvement could be maintained. Commercial equipment based on the design is being manufactured and marketed by Pye T.V.T. under license. It is in regular use on both the BBC1 and BBC2 networks. Author

N84-32616 State Univ. of New York, Buffalo.
RANDOM MULTIPLE ACCESS METHODS IN MULTI-USER COMMUNICATION SYSTEMS Ph.D. Thesis
Lazaros Merakos 1984 220 p
Avail: Univ. Microfilms Order No. DA8410573

In a multi-user communication system a number of data transmitting users exchange information using a communication channel. Random access algorithms provide the means by which the capacity of the multiple access channel is shared by a large population of bursty users under distributed control. It is assumed that only one message at a time can be successfully transmitted over the channel. Users gain access into the channel on a contention basis, and utilize some form of broadcast feedback information to resolve their conflicts. Dissert. Abstr.

N84-32617 Department of the Navy, Washington, D. C.
AROUND-A-MAST QUADRIFILAR MICROSTRIP ANTENNA Patent
E. S. Harris, inventor (to Navy) Issued 1 Oct. 1980 4 p (AD-D011051; US-Patent-4,349,824; US-Patent-Appl-SN-192742; US-Patent-Class-343-700) Avail: US Patent & Trademark Office CSCL 09/5

A down link UHF antenna is designed which includes four

equispaced arms metal plated at an angle on a fiberglass cylinder. A coaxial connector is connected to each of the four arms with the metal plated inner surface as the common ground.
Author (GRA)

N84-32618 Department of the Navy, Washington, D. C.
SIGNAL WAVEFORM DETECTOR USING SYNTHETIC FM DEMODULATION Patent
J. H. Cole, inventor (to Navy) Issued 13 Mar. 1984 6 p
(AD-D011055; US-Patent-4,436,425; US-Patent-Appl-SN-362813; US-Patent-Class-356-361) Avail: US Patent & Trademark Office CSCL 17/2

A test signal waveform detector that includes a fiber optic interferometer wherein the phase difference of the two parts of a split laser beam is modulated by the waveform of a sinusoidal test signal which is to be detected and by the waveform of a sinusoidal reference signal, and the two parts of the split beam are recombined and mixed on the face of a photodetector. A signal conversion circuit converts the ac signal that carries the test signal information as an equivalent frequency modulation, and a demodulator extracts the test signal information from the latter ac signal.
Author (GRA)

N84-32619 Department of the Air Force, Washington, D.C.
SIMULATION OF AN ELECTRONIC COUNTERMEASURE TECHNIQUE Patent
J. W. Russell, inventor (to Air Force) Issued 12 Jun. 1984 13 p Supersedes AD-D008952
(AD-D011143; US-Patent-4,454,513; US-Patent-Appl-SN-287451) Avail: US Patent & Trademark Office CSCL 17/4

An apparatus for use in evaluating the effectiveness of an ECM technique, such as the Cross Eye technique, which transmits RF signals from spatially separated antennas against a hostile radar system, such as a monopulse radar. The invention splits the radar transmit RF signal into separate paths, applies the ECM signal, and calibrates the combined radar-ECM signal for phase and amplitude balance after every pulse repitition interval. The signal is down converted to an intermediate frequency where a radar receive antenna is simulated. Following the antenna, an injection network up converts the frequency of the signal and adds computer controlled inputs (including echoes) prior to sending it to the radar receiver for final processing.
Author (GRA)

N84-32620*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SYNCHRONIZATION TRACKING IN PULSE POSITION MODULATION RECEIVER Patent Application
Victor A. Vilnrotter, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 7 Aug. 1984 14 p
(Contract NAS7-100)
(NASA-Case-NPO-16256-1; NAS 1.71:NPO-16256-1; US-Patent-Appl-SN-638586) Avail: NTIS HC A02/MF A01 CSCL 17B

A clock pulse generator for decoding pulse position modulation in an optical communication receiver is synchronized by a delay tracking loop which multiplies impulses of a data pulse by the square wave clock pulses from the generator to produce positive impulses when the clock pulse is of one level, and negative impulses when the clock pulse is of another level. A delay tracking loop integrates the impulses and produces an error signal that adjusts the delay so the clock pulses will be synchronized with data pulses. A dead time tau(d) provided between data pulses of an interval tau(p) in the data pulse period tau. When synchronized, the average number of positive impulses integrated will equal the average number of negative impluses over the continuous stream of data pulses.
NASA

N84-32621*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRONIC SWITCHING SPHERICAL ARRAY (ESSA) ANTENNA SYSTEMS
Richard P. Hockensmith Jul. 1984 56 p
(NASA-TM-86127; NAS 1.15:86127) Avail: NTIS HC A04/MF A01 CSCL 20N

ESSA (Electronic Switching Spherical Array) is an antenna system conceived, developed and qualified for linking satellite data transmissions with NASA's tracking and data relay satellites (TDRSS) and tracking and data acquisition satellites (TDAS). ESSA functions in the S band frequency region, cover 2 pi or more steradians with directional gain and operates in multiple selectable modes. ESSA operates in concert with the NASA's TDRS standard transponder in the retrodirective mode or independently in directional beam, program track and special modes. Organizations and projects to the ESSA applications for NASA's space use are introduced. Coverage gain, weight power and implementation and other performance information for satisfying a wide range of data rate requirements are included.
Author

N84-32622*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Apr. - Jun. 1984
E. C. Posner, ed. 15 Aug. 1984 230 p refs
(NASA-CR-173885; JPL-TDA-PR-42-78; NAS 1.26:173885) Avail: NTIS HC A11/MF A01 CSCL 17B

This publication provides reports on work performed for the Office of Space Tracking and Data Systems (OSTDS). It reports on the activities of the deep space network (DSN) and the Ground Communications Facility (GCF). Topics discussed on the operation of the DSN include: (1) spacecraft-ground communications; (2) station control and system technology; and (3) capabilities for new projects for systems implementation. The GCF compatibility with packets and data compression is discussed. In geodynamics, the publication reports on the application of radio interferometry at microwave frequencies for geodynamic measurements. For individual titles, see N84-32623 through N84-32643.

N84-32623*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A HIGH-PERFORMANCE HYBRID RF ISOLATION AMPLIFIER c33
G. L. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 1-8 (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09A

A high-performance hybrid RF Isolation Amplifier (Iso-Amp) has been developed at JPL. The circuit exhibits a unique combination of RF characteristics at performance levels exceeding those of any commercially available device. Recent improvments in the design have resulted in significantly higher reverse isolation, a four-fold increase in bandwidth and improve reliability. These devices are very useful in RF and IF signal conditioners, instrumentation, and signal generation and distribution equipment. These Iso-Amps should find wide application in future DSN and R&D RF systems.
Author

N84-32624*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPTIMIZATION OF ANTENNA STRUCTURE DESIGN
R. Levy *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 9-23 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20N

Optimality criteria design is applied for large antenna structures with multiple constraints on microwave performance. The constraints are on accuracy of the structure: restrictions on the microwave pathlength error, and the antenna pointing error. The examples given show convergence to low-weight feasible designs that satisfy the constraints. Truss-member sizes are automatically selected from tables of commercially available structural shapes, and approximations results from the method of selection are found moderate. The multiple constraint design is shown to be more effective in meeting constraints than the old envelop method. For practical structures, the new design method can be performed within reasonable core size and computation time.
Author

N84-32625*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH POWER K SUB a -BAND TRANSMITTER FOR PLANETARY RADAR AND SPACECRAFT UPLINK **c33**
A. M. Bhanji, D. J. Hoppe, R. W. Hartop, E. W. Stone (Varian Associates, Inc.), W. A. Imbriale (Varian Associates, Inc.), D. Stone, and M. Caplan *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 24-48 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09A

A proposed conceptual design of a 400 kW continuous wave (CW)K sub a band transmitter and associated microwave components to be used for planetary radar and serve as a prototype for future spacecraft uplinks is discussed. System requirements for such a transmitter are presented. Performance of the proposed high-power millimeter wave tube, the gyroklystron is discussed. Parameters of the proposed power amplifier, beam supply, and monitor and control devices are also presented. Microwave transmission line components consisting of signal monitoring devices, signal filtering devices, and an overmoded corrugated feed are discussed. Finally, an assessment of the state of the art technology to meet the system requirements is given and possible areas of difficulty are summarized. Author

N84-32626*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MAGNETIC REFRIGERATION DEVELOPMENT **c37**
D. D. Deardoff and D. L. Johnson *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 49-58 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 13I

Magnetic refrigeration is being developed to determine whether it may be used as an alternative to the Joule-Thomson circuit of a closed cycle refrigerator for providing 4 K refrigeration. An engineering model 4-15 K magnetic refrigerator has been designed and is being fabricated. This article describes the overall design of the magnetic refrigerator. Author

N84-32627*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POTENTIAL SURFACE IMPROVEMENTS BY BUMP REMOVAL FOR 64-m ANTENNA
S. Katow and C. N. Guiar *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 59-72 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20N

The surface panels of the main reflector of the 64-m antenna are initially set at an elevation angle of 45 deg, where most tracking occurs, to ideally match a prescribed praboloid. As the antenna is rotated about the elevation axis, distortions are introduced at the surface panel's supporting nodes as well as at the main reflector backup structure by changes in the direction of the gravity forces relative to the reflector symmetric axis. Major bump displacements could be corrected by controlling the position of the surface panel corners using adjustable mechanical jacks that change in length with the antenna elevation angle. The analysis of two bump-removal configurations is presented and one unique adjustment mechanism is proposed. A gain recovery of 0.2 dB at X-band would be available if the reflector structure distortion rms were reduced from 0.63 mm (0.025 in.) to 0.15 mm (0.006 in.). Author

N84-32628*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE 64-m ANTENNA AUTOMATIC SUBREFLECTOR FOCUSING CONTROLLER
C. N. Guiar and L. W. Duff *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 73-78 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20N

Defocussing of the radio frequency beam arises from gravity-induced structural deformations as the 64 m Deep Space Network antenna rotates about the elevation axis. The subreflector controller generates the axial (z) and lateral (y) offset corrections necessary to move the subreflector, thus minimizing the gain losses due to this defocussing. The technique used to determine these offset errors is discussed, and a description of the new subreflector controller is presented. Author

N84-32629*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERMODULATION PRODUCT LEVELS IN FLAME-SPRAYED MATERIALS **c24**
C. S. Yung, F. W. Stoller, F. L. Lansing, and S. Brazil (Ford Aerospace and Communications Corp., Palo Alto, Calif.) *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 79-98 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 11D

A preliminary investigation on intermodulation product (IMP) levels of fiberglass-backed flame-sprayed surfaces was completed. The purpose was to demonstrate the use of modified techniques and materials in combustion flame spraying of formed surfaces in reducing intermodulation products. The approach used improved metal wire stock without impurities or with smaller droplet sizes, high-temperature release agents, wire stock with low electrical resistance, variations in spraying distances, and intense buffing processes which amalgamate the material gaps and droplets in an effort to fabricate IMP-free lightweight and low cost subreflectors. Positive material candidates were found with an IMP level around -150 dB, which is comparable to solid aluminum surfaces used as a reference. Author

N84-32630*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE SIMULATION FOR UNIT-MEMORY CONVOLUTIONAL CODES WITH BYTE-ORIENTED VITERBI DECODING ALGORITHM **c61**
Q. D. Vo *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 99-107 ref (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09B

A software package developed to simulate the performance of the byte-oriented Viterbi decoding algorithm for unit-memory (UM) codes on both 3-bit and 4-bit quantized AWGN channels is described. The simulation is shown to require negligible memory and less time than that for the RTMBEP algorith, although they both provide similar performance in terms of symbol-error probability. This makes it possible to compute the symbol-error probability of large codes and to determine the signal-to-noise ratio required to achieve a bit error rate (BER) of 0.000001 for corresponding concatenated systems. A (7, 10/48) UM code, 10-bit Reed-Solomon code combination achieves the required BER at 1.08 dB for a 3-bit quantized channel and at 0.91 dB for a 4-bit quantized channel. Author

N84-32631*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SIMPLE ALGORITHM FOR THE METRIC TRAVELING SALESMAN PROBLEM **c64**
M. J. Grimm *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 108-114 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 12A

An algorithm was designed for a wire list net sort problem. A branch and bound algorithm for the metric traveling salesman problem is presented for this. The algorithm is a best bound first recursive descent where the bound is based on the triangle inequality. The bounded subsets are defined by the relative order of the first K of the N cities (i.e., a K city subtour). When K equals N, the bound is the length of the tour. The algorithm is implemented as a one page subroutine written in the C programming language for the VAX 11/750. Average execution times for randomly selected planar points using the Euclidean metric are 0.01, 0.05, 0.42, and 3.13 seconds for ten, fifteen, twenty, and twenty-five cities, respectively. Maximum execution times for a hundred cases are less than eleven times the averages. The speed of the algorithms is due to an initial ordering algorithm that

is a N squared operation. The algorithm also solves the related problem where the tour does not return to the starting city and the starting and/or ending cities may be specified. It is possible to extend the algorithm to solve a nonsymmetric problem satisfying the triangle inequality. . Author

N84-32632*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SYMBOL-STREAM COMBINER: DESCRIPTION AND DEMONSTRATION PLANS
W. J. Hurd, L. J. Reder, and M. D. Russell *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 115-121 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20N

A system is described and demonstration plans presented for antenna arraying by symbol stream combining. This system is used to enhance the signal-to-noise ratio of a spacecraft signals by combining the detected symbol streams from two or more receiving stations. Symbol stream combining has both cost and performance advantages over other arraying methods. Demonstrations are planned on Voyager 2 both prior to and during Uranus encounter. Operational use is possible for interagency arraying of non-Deep Space Network stations at Neptune encounter. Author

N84-32633*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ERROR-TRELLIS SYNDROME DECODING TECHNIQUES FOR CONVOLUTIONAL CODES c61
I. S. Reed (Univ. of Southern Calif.) and T. K. Truong *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 122-134 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09B

An error-trellis syndrome decoding technique for convolutional codes is developed. This algorithm is then applied to the entire class of systematic convolutional codes and to the high-rate, Wyner-Ash convolutional codes. A special example of the one-error-correcting Wyner-Ash code, a rate 3/4 code, is treated. The error-trellis syndrome decoding method applied to this example shows in detail how much more efficient syndrome decoding is than Viterbi decoding if applied to the same problem. For standard Viterbi decoding, 64 states are required, whereas in the example only 7 states are needed. Also, within the 7 states required for decoding, many fewer transitions are needed between the states. Author

N84-32634*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COHERENT DIGITAL DEMODULATION OF A RESIDUAL CARRIER SIGNAL USING IF SAMPLING
R. Sfeir, S. Aguirre, and W. J. Hurd *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 135-142 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 17B

An analysis is presented of a digital technique for the coherent demodulation of a residual carrier signal with a biphase modulated square wave subcarrier. The processing technique employs the concept of intermediate frequencies IF sampling. An optimum Costas loop is used for subcarrier demodulation and data-aided carrier tracking, i.e., combined Costas and residual carrier tracking. It is shown that the loops perform essentially the same as the corresponding analog loops in terms of signal-to-noise ratio and loop bandwidth. The sampling does not introduce biases or other significant effects on the loops, provided that the loop bandwidth is very small compared to the symbol rate, and that the number of samples per symbol is large compared to inverse loop bandwidth. M.A.C.

N84-32635*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STRATEGY FOR SUCCESSFUL DEEP SPACE INFORMATION TRANSMISSION IN BAD WEATHER
L. Swanson and J. H. Yuen *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 143-151 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 17B

To retrieve data during bad weather, most missions slow the data rate to accommodate a certain amount of attenuation, or to allow for all but a very small percentage of all-weather conditions. This system has two well-known and balancing disadvantages: no data is received reliably during very bad weather, and the data rate is slowed during good weather. A system of processing is described that encodes the most critical data more heavily, allowing it to be retrieved under bad conditions, while at the same time allowing most of the data to be sent at a higher data rate. M.A.C.

N84-32636*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TROPOSPHERIC DELAY EFFECTS IN RADIO INTERFEROMETRY
G. Lanyi *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 152-159 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20N

A new tropospheric mapping function is derived which is more accurate than previous mapping functions above elevations of 4 degrees. The error due to the given analytic approximation is estimated to be less than 0.02% for elevation angles larger than 6 degrees, (less than 0.4 cm at 6 degrees, and approximately 0.004% or 0.03 cm at 20 degrees). The mathematical expansion used in the derivation is valid for any laterally homogeneous atmospheric model of refractivity. The new mapping function, computer generated ray tracing tables and other mapping functions are compared. The results can be used in correcting for tropospheric delays of radio signals. Author

N84-32637*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INVESTIGATION AND REHABILITATION TO EXTEND SERVICE LIFE OF DSS-13 ANTENNA CONCRETE FOUNDATION c31
A. A. Riewe, Jr. *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 160-171 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 13B

An investigation to establish the cause and, devise a repair technique to maintain the serviceability of the DSS-13 26 meter antenna is described. Core samples are obtained from the concrete and various laboratory tests conducted. In-place nondestructive type tests are also performed. The tests established that the concrete is deteriorating because of alkali aggregate reactivity. This is a phenomenon wherein certain siliceous constituents present in some aggregates react with alkalies in the portland cement to produce a silica gel which, in turn, imbibes water, swells, and cracks the concrete. The scheme consists of a supplemental steel frame friction pile anchored grade beam encircling the existing foundation. This system provides adequate bracing against base shear and overturning due to seismic loading. Larger cracks are sealed using a pressure injected two-component epoxy. M.A.C.

N84-32638*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASTRAN STRUCTURAL MODEL FOR THE LARGE 64-METER ANTENNA PEDESTAL. PART 3: APPLICATIONS TO HYDROSTATIC BEARING OIL FILM c39
C. T. Chian and D. Schonfeld *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 172-183 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20K

Investigations are conducted on the 64-meter antenna hydrostatic bearing oil film thickness under a variety of loads and elastic moduli. These parametric studies use a NASTRAN pedestal structural model to determine the deflections under the hydrostatic bearing pad. The deflections form the input for a computer program to determine the hydrostatic bearing oil film thickness. For the future 64-meter to 70-meter antenna extension and for the 2.2-meter (86-in.) haunch concrete replacement cases, safe oil film thickness (greater than 0.13 mm (0.005 in.) at the corners of

the pad) are predicted. The effects of varying moduli of elasticity for different sections of the pedestal and the film height under distressed runner conditions are also studied. M.A.C.

N84-32639*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AVAILABILITY OF THE DSN TELEMETRY DATA SYSTEM AND ITS MAJOR ELEMENTS, INCLUDING THE TWM ASSEMBLIES c17
R. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 184-191 ref (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09F

The DSN discrepancy report system which records all outages of DSN data systems that occur during mission support operations is described. The recorded outages of the telemetry data system for 1981 through 1983 were tabulated and availability characteristics of the telemetry data system and several of its major elements, including the traveling wave maser (TWM) Assemblies were developed. Availability characteristics of the TWM assemblies are compared with those of other DSN subsystems and assemblies. It is found that for a three year period, the availability of the telemetry data system is 99.0%, and its mean time to restore service is 0.9 hours; the availability of the TWM assemblies is 99.83%, and their mean time to restore service is 2.5 hours. E.A.K.

N84-32640*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STUDY OF DSN TRAVELING WAVE MASER SYSTEM RELIABILITY c36
R. Stevens and C. P. Wiggins *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 192-198 ref (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20E

Reliability and availability characteristics of the DSN traveling wave maser (TWM) Assemblies are reported for the years 1981 through 1983, the charcteristics determined are: mean time between failures (MTBF) - 1200 hours; mean time to restore service (MTTRS) - 2.5 hours; and availability - 99.83%. The TWM MTBF is very good as compared to other DSN subsystems and assemblies. The TWM MTTRS is currently about three times as long as the average of other DSN subsystems. The dominant cause of TWM failures is contamination of the helium gas in the closed cycle refrigerators. Station configurations that do not provide TWM redundancy are subject to reception outages for long periods of time. Recommendations are made to improve the TWM Assembly availability characteristics for future mission support operations. E.A.K.

N84-32641*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GCF COMPATIBILITY WITH PACKETS AND DATA COMPRESSION
E. C. Posner and P. Merkey *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 199-201 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 17B

Some missions which use packets and/or compression may want an undetected GCF block error rate of 10 to the minus 6th power. It is shown that the present GCF meets this requirement. E.A.K.

N84-32642*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EARTH ORIENTATION EFFECTS ON MOBILE VLBI BASELINES
S. L. Allen *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 202-215 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20N

Improvements in data quality for the mobile VLBI systems have placed higher accuracy requirements on Earth orientation calibrations. Errors in these calibrations may give rise to systematic effects in the nonlength components of the baselines. Various sources of Earth orientation data were investigated for calibration of Mobile VLBI baselines. Significant differences in quality between the several available sources of UT1-UTC were found. It was shown that the JPL Kalman filtered space technology data were at least as good as any other and adequate to the needs of current Mobile VLBI systems and observing plans. For polar motion, the values from all service suffice. The effect of Earth orientation errors on the accuracy of differenced baselines was also investigated. It is shown that the effect is negligible for the current mobile systems and observing plan. E.A.K.

N84-32643*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MOJAVE BASE STATION IMPLEMENTATION
C. G. Koscielski *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 216-224 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20N

A 12.2 meter diameter X-Y mount antenna was reconditioned for use by the crustal dynamic project as a fixed base station. System capabilities and characteristics and key performance parameters for subsystems are presented. The implementation is completed. E.A.K.

N84-32644*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE 20 X 20 HIGH SPEED MICROWAVE SWITCHES
Alan Saunders Sep. 1984 24 p refs
(NASA-TM-83775; E-2162; NAS 1.15:83775) Avail: NTIS HC A03/MF A01 CSCL 09A

Tests were conducted at NASA Lewis Research Center to characterize the proof-of-concept matrix switches built under NASA contract by Ford Aerospace and Aeronautics Corporation at Palo Alto, California, and the General Electric Company at Valley Forge, Pennsylvania. The contract requirements and goals are tabulated along with the results of the NASA tests. Characteristics examined are bandwidth, insertion loss, ripple, switching speed, isolation, standing wave ratio (input and output), deviation from linear phase, noise figure, reconfiguration rates, spurious responses, gain compression, and third order intermodulation distortion. A brief description of the testing method and a statistical analysis of the test results for each of the switches are provided. Author

N84-32645*# Illinois Univ., Urbana. Electromagnetics Lab.
NUMERICAL METHODS FOR ANALYZING ELECTROMAGNETIC SCATTERING Semiannual Report, 25 Mar. - 24 Sep. 1984
S. W. Lee, Y. T. Lo, and S. L. Chuang 24 Sep. 1984 45 p refs (Grant NAG3-475)
(NASA-CR-173916; NAS 1.26:173916) Avail: NTIS HC A03/MF A01 CSCL 20N

The wave attenuation in a cylindrical waveguide coated with lossy dielectric material was studied. The scope was extended to the high frequency case for calculating attenuation coefficients and propagation constants of a dielectric coated circular waveguide. The magnetic material coating was studied. At low frequency a one way 3dB attenuation was achieved within a longitudinal distance of one diameter. A software program was generated to plot the field patterns of the lowest 30 modes in the cylindrical waveguides. E.R.

N84-32646*# LinCom Corp., Los Angeles, Calif.
AUTONOMOUS INTEGRATED RECEIVE SYSTEM (AIRS) REQUIREMENTS DEFINITION. VOLUME 1: EXECUTIVE SUMMARY Final Report
C. M. Chie and W. C. Lindsey Aug. 1984 11 p 4 Vol.
(Contract NAS5-26772)
(NASA-CR-175261; NAS 1.26:175261; TR-0884-8211-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 17B

Distributed processing in the design and operation of the augmented TDRSS and the succeeding TDAS in the 1990's is discussed with the emphasis on the development of the autono-

mous integrated receive system (AIRS) for the operation of the S-band single access (SSA) return link in the White Sands ground terminal. This receive system has the capability of self configuration, real-time operation, and self diagnostic. The tasks of Doppler correction, demodulation, detection, and decoding are performed in an integrated manner where useful information are shared and used by ALL portions of AIRS performing these tasks. Operating modes, maintenance, system architecture, and performance characteristics are described. A.R.H.

N84-32647*# LinCom Corp., Los Angeles, Calif.
AUTONOMOUS INTEGRATED RECEIVE SYSTEM (AIRS) REQUIREMENTS DEFINITION. VOLUME 2: DESIGN AND DEVELOPMENT Final Report
C. M. Chie, M. A. White, W. C. Lindsey, F. Davarian, and R. C. Dixon Aug. 1984 197 p refs 4 Vol.
(Contract NAS5-26772)
(NASA-CR-175262; NAS 1.26:175262; TR-0884-8211-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 17B

Functional requirements and specifications are defined for an autonomous integrated receive system (AIRS) to be used as an improvement in the current tracking and data relay satellite system (TDRSS), and as a receiving system in the future tracking and data acquisition system (TDAS). The AIRS provides improved acquisition, tracking, bit error rate (BER), RFI mitigation techniques, and data operations performance compared to the current TDRSS ground segment receive system. A computer model of the AIRS is used to provide simulation results predicting the performance of AIRS. Cost and technology assessments are included. Author

N84-32648*# LinCom Corp., Los Angeles, Calif.
AUTONOMOUS INTEGRATED RECEIVE SYSTEM (AIRS) REQUIREMENTS DEFINITION. VOLUME 3: PERFORMANCE AND SIMULATION Final Report
C. M. Chie, Y. T. Su, W. C. Lindsey, and J. Koukos Aug. 1984 321 p refs 4 Vol.
(Contract NAS5-26772)
(NASA-CR-175263; NAS 1.26:175263; TR-0884-8211-Vol-3) Avail: NTIS HC A14/MF A01 CSCL 17B

The autonomous and integrated aspects of the operation of the AIRS (Autonomous Integrated Receive System) are discussed from a system operation point of view. The advantages of AIRS compared to the existing SSA receive chain equipment are highlighted. The three modes of AIRS operation are addressed in detail. The configurations of the AIRS are defined as a function of the operating modes and the user signal characteristics. Each AIRS configuration selection is made up of three components: the hardware, the software algorithms and the parameters used by these algorithms. A comparison between AIRS and the wide dynamics demodulation (WDD) is provided. The organization of the AIRS analytical/simulation software is described. The modeling and analysis is for simulating the performance of the PN subsystem is documented. The frequence acquisition technique using a frequency-locked loop is also documented. Doppler compensation implementation is described. The technological aspects of employing CCD's for PN acquisition are addressed. B.G.

N84-32649*# LinCom Corp., Los Angeles, Calif.
AUTONOMOUS INTEGRATED RECEIVE SYSTEM (AIRS) REQUIREMENTS DEFINITION. VOLUME 4: FUNCTIONAL SPECIFICATION FOR THE PROTOTYPE AUTOMATED INTEGRATED RECEIVE SYSTEM (AIRS) Final Report
C. M. Chie Aug. 1984 82 p 4 Vol.
(Contract NAS5-26772)
(NASA-CR-175264; NAS 1.26:175264; TR-0884-8211-Vol-4) Avail: NTIS HC A05/MF A01 CSCL 17B

The functional requirements for the performance, design, and testing for the prototype Automated Integrated Receive System (AIRS) to be demonstrated for the TDRSS S-Band Single Access Return Link are presented. M.A.C.

N84-32650*# Hughes Aircraft Co., El Segundo, Calif. Radar Systems Group.
Ku-BAND RENDEZVOUS RADAR PERFORMANCE COMPUTER SIMULATION MODEL Final Report
H. G. Magnusson and M. F. Goff Jun. 1984 90 p refs
(Contract NAS9-15840)
(NASA-CR-171804; NAS 1.26:171804; RSG-PG-P40629; DRL-T-1544-2; DRD-7) Avail: NTIS HC A05/MF A01 CSCL 17I

All work performed on the Ku-band rendezvous radar performance computer simulation model program since the release of the preliminary final report is summarized. Developments on the program fall into three distinct categories: (1) modifications to the existing Ku-band radar tracking performance computer model; (2) the addition of a highly accurate, nonrealtime search and acquisition performance computer model to the total software package developed on this program; and (3) development of radar cross section (RCS) computation models for three additional satellites. All changes in the tracking model involved improvements in the automatic gain control (AGC) and the radar signal strength (RSS) computer models. Although the search and acquisition computer models were developed under the auspices of the Hughes Aircraft Company Ku-Band Integrated Radar and Communications Subsystem program office, they have been supplied to NASA as part of the Ku-band radar performance comuter model package. Their purpose is to predict Ku-band acquisition performance for specific satellite targets on specific missions. The RCS models were developed for three satellites: the Long Duration Exposure Facility (LDEF) spacecraft, the Solar Maximum Mission (SMM) spacecraft, and the Space Telescopes. S.B.

N84-32651# Massachusetts Inst. of Tech., Cambridge.
ATMOSPHERIC PROPAGATION EFFECTS ON INFRARED RADARS Final Report, 15 Jun. 1980 - 31 Mar. 1984
J. H. Shapiro 5 Jun. 1984 11 p
(Contract DAAG29-80-K-0022)
(AD-A143196; ARO-16632.8-EL) Avail: NTIS HC A02/MF A01 CSCL 17/9

Compact coherent CO2 laser radars have the potential for greatly improved angle, range, and velocity resolution relative to their microwave radar counterparts. This research program was aimed at obtaining quantitative understanding of target reflection and atmospheric propagation effects on such laser radars through a combination of theory and experiments. Toward those ends, improved statistical signal models were developed, and corroborated through measurements, for turbulence and speckle effects in 2-D pulsed imager operation. Speckle and clutter effects in 2-D Doppler imager operation were also studied through analysis and measurements. Possible bad-weather laser radar operation, using scattered light, was considered theoretically, but shown to require use of a different laser wavelength than the 10.6 micron CO2 laser wavelength. A theoretical study of the use of high time-bandwidth (TW) product signal waveforms in 3-D imaging radar was also performed. The experimental portions of the research were carried out under a collaboration arrangement with the Opto-Radar Systems Group at MIT Lincoln Laboratory.
Author (GRA)

N84-32652# Rome Air Development Center, Griffiss AFB, N.Y.
HF PREDICTION USING ADIABATIC INVARIANT THEORY
E. J. Tichovolsky Mar. 1984 38 p
(AF Proj. 4600)
(AD-A143239; AD-E750949; RADC-TR-84-59) Avail: NTIS HC A03/MF A01 CSCL 20/14

Gurevich and Tsedilina's adiabatic invariant theory for the potential well model of ionospheric HF radiowave propagation is reviewed and applied to a specific round-the-world (RTW) propagation path. Propagation modes (ducting, ground-hop and chordal) are qualitatively deduced from charts of the adiabatic invariants I(F), I(FE), I(FE+E) and I(1) vs path length. Quantitative results are presented in the form of a simulated RTW ionogram between an elevated source and receiver. In support of RADC's orbiting receiver experiment, the robustness of global HF propagation is displayed in the form of synoptic maps of I(E), I(F), I(FE) and I(1),

using the IONCAP medium model ionosphere. These maps show the abundance of various propagation modes on a world-wide basis. Author (GRA)

N84-32653# New Mexico State Univ., Las Cruces. Physical Science Lab.
ANTENNA PERFORMANCE VERIFICATION AT LAUNCH SITE. A FEASIBILITY STUDY ON PREFLIGHT PERFORMANCE TESTING OF STRIPLINE SLOT ARRAYS MOUNTED ON A ROCKET
H. D. Weinschel and A. Waterman Hanscom AFB, Mass. AF Geophysics Lab. Jan. 1984 80 p
(Contract F19628-81-C-0004)
(AD-A143266; AFGL-TR-84-0069; SR-2) Avail: NTIS HC A05/MF A01 CSCL 09/5

The Physical Science Laboratory/NMSU made a feasibility study for preflight testing of cylindrical stripline arrays at the launch site. Far-field radiation patterns were compared to near-field probe measurements. Various array damages were simulated. The results showed a good correlation between the near-field probe measurements and the far-field patterns. The conclusion drawn from the study was that damaged arrays could be detected by near-field probing in the field. However, intermittent problems such as pinched coaxial cables and loose connectors may go undetected.
Author (GRA)

N84-32654# Naval Research Lab., Washington, D. C.
LENGTH DISTRIBUTION OF CHORDS THROUGH A RECTANGULAR VOLUME Final Report
W. L. Bendel 3 Jul. 1984 17 p
(AD-A143302; NRL-MR-5369) Avail: NTIS HC A02/MF A01 CSCL 18/8

The chord length distribution of penetrating radiation in rectangular parallelepipeds is of concern in regard to spacecraft electronic, as single event upsets can be produced by the ionization along the path of a high-energy particle. Both differential and integral chord length distributions are presented here. Two approximations to the integral distribution are discussed.
Author (GRA)

N84-32655# Air Force Geophysics Lab., Hanscom AFB, Mass.
A PROBABILISTIC MODEL FOR PREDICTING THE DURATION OF LEVELS OF ELECTROMAGNETIC TRANSMISSION IN FALLING SNOW: ENVIRONMENTAL RESEARCH PAPERS
R. M. Dyer 3 Feb. 1984 33 p
(AF Proj. 6670)
(AD-A143318; AFGL-TR-84-0047; AFGL-ERP-870) Avail: NTIS HC A03/MF A01 CSCL 17/5

The increasing use of short wavelengths in systems required to operate in all weather conditions under battlefield environments requires that a commander in the field be able to predict the performance of these systems in the short term. A particular problem is the performance of millimeter and micrometer wavelengths in falling snow. This report presents a predictive model based on the assumption that the transmission like the snowfall intensity, behaves as a Markov chain. The model was developed from data acquired during the SNOW-ONE-A field program, and was tested for a hypothetical weapon system operating in the 8-12 micrometer band. The agreement of theory with measurements is excellent, but the model requires further testing on actual systems. Author (GRA)

N84-32656# Rome Air Development Center, Griffiss AFB, N.Y.
BROADSIDE RADAR CROSS SECTION OF THE PERFECTLY CONDUCTING CUBE
A. D. Yaghjian Feb. 1984 27 p
(AF Proj. 2305)
(AD-A143321; RADC-TR-84-11) Avail: NTIS HC A03/MF A01 CSCL 17/9

The broadside radar cross section (RCS) of the perfectly conducting cube is predicted from arbitrarily low to arbitrarily high frequencies, and compared to measured data taken for cube side lengths ranging from 0.15 to 4 wavelengths. The predicted and measured RCS curves agree to within the estimated experimental limits of accuracy of + or - 1 dB. At low frequencies the magnetic-field integral equation was augmented to eliminate its spurious homogeneous solutions and thus to produce the high accuracy beyond the resonance region up through the intermediate frequency range. At high frequencies the conventional diffraction solution was enhanced to produce high accuracy down through the intermediate frequency range into the resonance region. Close agreement between these two very different theoretical solutions in the intermediate frequency range confirmed the validity of each solution and permitted calculation of a reliable composite RCS curve for all frequencies. Author (GRA)

N84-32657# Naval Postgraduate School, Monterey, Calif.
RADIATION FROM INTENSE ELECTRON BEAMS ASSOCIATED WITH THE CHERENKOV MECHANISM
J. R. Neighbours and F. R. Buskirk 1 Jun. 1984 26 p
(AD-A143350; NPS-61-84-010) Avail: NTIS HC A03/MF A01 CSCL 20/8

This report summarizes the Cerenkov radiation to be expected from an intense electron beam for both the coherent and incoherent modes or radiation. The effects of a finite length beam are discussed with regard to beam diffraction, radiated power, and bunch shape. The appendices contain a discussion of the beam radiation pattern. Author (GRA)

N84-32658# Sperry Gyroscope Co., Clearwater, Fla.
RADIO FREQUENCY DISTRIBUTION ASSEMBLY
K. M. Culley 1984 32 p
(Contract N00014-82-C-2147)
(AD-A143575) Avail: NTIS HC A03/MF A01 CSCL 09/5

The Naval Research Laboratory (NRL) Radio Frequency Distribution Assembly (RFDA) is an interface between the Sperry four-channel, fast-switching synthesizer and the EF-111 jamming system antenna ports. The RFDS is a sophisticated, high-speed RF interface designed to convert the banded outputs of the four-channel synthesizer (16 ports) to 36 ports which represent six ordinal directions of arrival (DOA) for the EF-111 jamming system. The RFDS will distribute the RF signals while providing controlled RF amplitudes to simulate the antenna patterns of the EF-111 Electronic Warfare (EW) system. The simulation of the arrival angles which appear between the ordinal directions is performed by controlling the amplitude of the RF signal from the DOA channels. The RFDA is capable of operating over the frequency range of 500MHz to 18GHz, and can rapidly switch between varying frequencies and attenuation levels. GRA

N84-32659# Department of the Air Force, Washington, D.C.
SIMULTANEOUS DETECTION OF TIME COINCIDENT SIGNALS IN AN ADAPTIVE DOPPLER TRACKER Patent Application
A. W. Roeder, inventor (to Air Force) Filed 3 Dec. 1981 20 p
(AD-D011092; US-Patent-Appl-SN-329557) Avail: NTIS HC A02/MF A01 CSCL 17/2

The performance of an adaptive digital Doppler tracker having a sample data phase locked loop is improved by a circuit that detects and demodulates interfering signals. The tracker has a coherence sensor that provides signals indicating coherence and non-coherence conditions. An amplitude sensor generates a strong signal when interfering (time coincident) signals are received. The tracker includes both a coherent data detector and SSB processor. An interference detector receives the outputs of the coherence sensor and the amplitude sensor and generates an SSB enable signal in response to the coincidence of a strong signal and a non-coherent condition signal. The SSB enable signal disables the coherent data detector and enables the SSB processor which detects both interfering signals. Author (GRA)

N84-32660# Department of the Air Force, Washington, D.C.
PHASE SHIFT KEYING APPARATUS Patent Application
J. B. Dow, inventor (to Air Force) Filed 17 Apr. 1984 19 p
(AD-D011119; US-Patent-Appl-SN-601198) Avail: NTIS HC A02/MF A01 CSCL 17/2

A phase modulation low power integrated circuit communica-

tions arrangement which employs a frequency shift oscillator is disclosed. The frequency shift oscillator operates normally at a first frequency and is keyed to a second frequency for brief intervals to introduce cumulative first frequency phase change in an output signal. Subquadrature and larger increments of phase shift, spurious frequency component rejection with wave filters, and low power amplification of the modulated signal are also disclosed.
Author (GRA)

N84-32661# Oak Ridge National Lab., Tenn.
INTERMD: A COMPUTER PROGRAM TO PREDICT INTERMODULATION PRODUCT GENERATION ON TWO-WAY FM RADIO FREQUENCIES
J. A. Russell and A. L. Case Jul. 1984 12 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013767; ORNL/TM-9213) Avail: NTIS HC A02/MF A01

A computer program which was developed at the Oak Ridge National Laboratory to perform calculations on groups of two-way FM radio frequency assignments to determine if interference might be generated when two or more of the networks are used at the same time is describe. Intermodulation products are generated in a variety of ways, but the results have the same effect: the radio frequency signal generated appears to the receiver as a signal that cannot be distinguished from a signal actually transmitted on the receiver's input frequency. The purpose of INTERMD, the computer program described here, is to enable rapid determination, by calculation, of possible frequency combinations which could cause interference. DOE

N84-32662# Fermi National Accelerator Lab., Batavia, Ill.
BEAM CAVITY COUPLING IMPEDANCE
Robert Gluckstern (Maryland Univ., College Park, Md.) Jun. 1984 16 p refs
(Contract DE-AC02-76CH-03000)
(DE84-014064; FERMILAB/TM-1264) Avail: NTIS HC A02/MF A01

The beam cavity coupling impedance is formulated for the normal modes of the cavity. The longitudinal beam cavity coupling impedance was analyzed and it is noted that it can be easily adapted to the transverse impedance. It is anticipated that such a formulation may illuminate the behavior of the coupling impedance in various frequency limits. DOE

N84-32663# California Univ., Livermore. Lawrence Livermore Lab.
FOCUSING TWIST REFLECTOR FOR ELECTRON-CYCLOTRON RESONANCE HEATING IN THE TANDEM MIRROR EXPERIMENT-UPGRADE
B. W. Stallard, F. E. Coffield, B. Felker, J. Taska, T. E. Christensen (TRW, Inc., Redondo Beach, Calif.), N. C. Gallagher, Jr. (Purdue Univ., Lafayette, Ind.), and D. W. Sweeney (Purdue Univ., Lafayette, Ind.) May 1984 16 p refs Presented at the 4th Intern. Workshop on Electron-Cyclotron Emissions (ECE-ECRH), Frascati, Italy, 28-30 Mar. 1984
(Contract W-7405-eng-48)
(DE84-012954; UCRL-90784; CONF-840391-2) Avail: NTIS HC A02/MF A01

A twist reflector plate which linearly polarizes and focuses the TE/sub 01/ circular waveguide mode for heating hot electrons in the thermal barrier of the tandem mirror experiment-upgrade (TMX-U) is described. The plate polarizing efficiency is 95%, and it has operated satisfactorily at 150 kW power level. DOE

N84-32664# California Univ., Livermore. Lawrence Livermore Lab.
HIGH-POWER RF COMPRESSOR
C. W. Hartman, J. H. Hammer, and D. Meeker 30 Mar. 1984 11 p refs
(Contract W-7405-eng-48)
(DE84-013118; UCID-20054) Avail: NTIS HC A02/MF A01

Rapid compression of resonant RF fields in a coaxial cavity with a moving, magnetically confined plasma ring is discussed. The ring velocity can be a high, compression to high energy density and high power can be achieved before significant resistive loss or vaporization of the cavity walls occurs. An example is given of compressing 10(5) J of lambda = 15 cm stored energy to 2 x 10(6) J of lambda = 1.0 cm RF energy with the energy released in 3 nsec for a maximum power of 6 x 10(14) W. It is suggested that a proof of principle plasma ring accelerator experiment can provide a test by compressing 125 joules of 14 cm RF to 1.25 kJ of 1.4 cm radiation, released in 5 nsec for a peak power of 2.5 x 10(11) W. DOE

N84-32665# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
HIGH FREQUENCY RADAR SOFTWARE REFERENCE MANUAL FOR PRODUCT ONE
David C. Walden, James R. Winkelman, Lorne D. Matheson, Larry D. Schultz, and R. Gregg Merrill, ed. Feb. 1984 336 p
(PB84-194885; NOAA-TM-ERL-SEL-67; NOAA-84051704) Avail: NTIS HC A15/MF A01 CSCL 17I

This manual for use with the HF Radar Product 1 software was first distributed to users in draft form in 1978. It has been updated several times since then as the software has evolved. It is being formally published now to record the achievement and to form a more convenient reference manual for the use of this product. GRA

N84-32666# Institute for Telecommunication Sciences, Boulder, Colo.
MICROWAVE TERRESTRIAL LINK RAIN ATTENUATION PREDICTION PARAMETER ANALYSIS
E. J. Dutton Apr. 1984 193 p refs Sponsored in part by Army
(PB84-207984; NTIA/Rept-84/148) Avail: NTIS HC A09/MF A01 CSCL 17B

Because rain attenuation continues to be a problem for the operation of microwave links worldwide, the behavior and the prediction of rain rate and rain attenuation distributions on a worldwide basis are examined. Particular emphasis is placed on seven areas of the world of special interest to the U.S. Army Communications Electronics and Engineering-Installation Agency (USACEEIA). GRA

N84-32667# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT IN THE 162-174 MHz FREQUENCY BAND
F. P. Flynn and W. M. Moran Feb. 1984 78 p refs
(PB84-210244; NTIA/Rept-84/143) Avail: NTIS HC A05/MF A01 CSCL 17B

Information on allocation, frequency assignments and agency equipment usage, of the 162 to 174 MHz frequency band is presented along with the results of agency interviews. Present spectrum management techniques and associated problems are considered. This band contained 35,275 assignments, as of January 1982, which is approximately one-quarter of all the frequency assignments in the GMF. GRA

N84-32668# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
FREQUENCY CORRELATION OF HF SKYWAVE GROUND BACKSCATTER DOPPLER SPECTRA
R. M. Jones, J. P. Riley, and T. M. Georges May 1984 90 p refs
(PB84-204353; NOAA-TM-ERL-WPL-115) Avail: NTIS HC A05/MF A01 CSCL 17I

The frequency correlation of Doppler spectra from ionospherically propagated ground backscatter measured on 17 October 1980 is presented. As with direct sea-echo backscatter spectra, there is no significant frequency correlation other than that caused by the window (weighting function) used for the spectral analysis. This result supports a previous assumption used to analyze skywave sea-echo backscatter that ionospheric reflection does not introduce frequency correlation. GRA

N84-32669# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
STATISTICS AT HF SKYWAVE GROUND BACKSCATTER DOPPLER SPECTRA
R. M. Jones, J. P. Riley, and T. M. Georges May 1984 68 p refs
(PB84-204973; NOAA-TM-ERL-WPL-116; NOAA-84061103) Avail: NTIS HC A04/MF A01 CSCL 17I

Cumulative distribution functions (CDF's) are presented for Doppler spectra from skywave (ionospherically propagated) ground backscatter measured on 17 October 1980. The variance of the CDF's is much greater than would be expected if ionospheric reflection coefficient and ground backscatter coefficient were both Gaussian random variables. In contrast, skywave echoes from the sea show a normalized variance between 2 and 3, in agreement with a model that assigns a unit normalized variance to both the ionospheric reflection coefficient and the sea-echo backscatter. Furthermore, the CDF's for skywave sea-echo backscatter spectra show qualitative agreement with the Hankel distribution that would be expected if both ionospheric reflection coefficient and sea-echo backscatter were Gaussian random variables. The large variance in skywave ground backscatter is probably caused by observed trends of ground backscatter coefficient with range and azimuth. In addition, a new method is demonstrated for estimating the CDF of an ensemble that has only a few samples. GRA

N84-32581# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF ANTENNAS WITH WEAK SUPERDIRECTIVITY Abstract Only
I. M. Polishchuk *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 2 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 1900-1906 Original language document previously announced in IAA as A84-12578 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32582# Joint Publications Research Service, Arlington, Va.
ANGLE RESOLUTION OF WIDEBAND SIGNALS RECEIVED BY TWO SLIGHTLY DIVERSE LINEAR ANTENNA ARRAYS Abstract Only
S. T. Bagdasaryan and Ye. P. Zinevich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 2-3 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 1926-1930 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32583# Joint Publications Research Service, Arlington, Va.
THERMOSCOPIC STUDY OF DIFFRACTION CURRENT DISTRIBUTION Abstract Only
A. N. Gorgoshidze and Yu. I. Khvorostyanoy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 3 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 2057-2060 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32584# Joint Publications Research Service, Arlington, Va.
CONCERNING POWER RECOVERED BY RECEIVING ANTENNA FROM INCIDENT FIELD Abstract Only
Ya. N. Feld *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 4 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2313-2319 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32585# Joint Publications Research Service, Arlington, Va.
INTENSITY OF RADIOWAVE SCATTERING ON ANISOTROPIC IRREGULARITIES WITH VARIOUS POSITIONS OF SCATTERING VOLUME ABOUT CAUSTIC ZONE Abstract Only
S. A. Namazov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 4 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2320-2329 Original language document previously announced in IAA as A84-20153 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32586# Joint Publications Research Service, Arlington, Va.
REFLECTION OF ELECTROMAGNETIC WAVES FROM INHOMOGENEOUS MEDIA Abstract Only
S. N. Stolyarov and Yu. A. Filatov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 5 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2330-2335 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32588# Joint Publications Research Service, Arlington, Va.
RELATIONS BETWEEN ALGORITHMS OF ADAPTIVE OPTIMIZATION OF ANTENNA ARRAYS AND ALGORITHMS OF OPTIMUM DETECTION OF MULTIDIMENSIONAL STOCHASTIC SIGNAL Abstract Only
V. G. Gusev and Ye. V. Cherenkova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 6 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2366-2372 Original language document previously announced as A84-20159 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32589# Joint Publications Research Service, Arlington, Va.
AUTOCORRELATION RECEIVER FOR DOPPLER SHORT-RANGE RADAR SYSTEMS Abstract Only
V. L. Kryzhanovskiy and Ya. I. Stefanishin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 6 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 12, Dec. 1983 p 26-30 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32590# Joint Publications Research Service, Arlington, Va.
THRESHOLD SIGNALS FOR DETECTOR HAVING STABILIZATION OF FALSE ALARM PROBABILITY Abstract Only
A. D. Pluzhnikov and V. V. Savchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 7 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 12, Dec. 1983 p 53-55 Original language document previously announced in IAA as A84-19721 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32595# Joint Publications Research Service, Arlington, Va.
SIMULATOR-PROBE FOR DIAGNOSTIC TESTING OF SHORT-WAVE RADIO CHANNELS Abstract Only
Yu. M. Gasparyan, R. M. Movsesyan, M. G. Oganesyan, G. A. Poliyevskiy, and P. A. Shirinyan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 24-25 Transl. into ENGLISH from Prom. Armenii (Yerevan, USSR), no. 10, Oct. 1983 p 20-22 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32597# Joint Publications Research Service, Arlington, Va.
RANDOM SIGNAL RECOGNITION BASED ON SPECTRAL MOMENTS Abstract Only
B. A. Atayants and V. S. Parshin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 12, Dec. 1983 p 55-57 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-33348# Massachusetts Inst. of Tech., Cambridge.
MICROWAVE AND QUANTUM MAGNETICS
Fredric R. Morgenthaler, Robert L. Kyhl, T. Bhattacharjee, and Dale A. Zeskind *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 55-63 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33350# Massachusetts Inst. of Tech., Cambridge.
ELECTROMAGNETIC WAVE THEORY AND REMOTE SENSING
Jin Au Kong, W. C. Chew, S.-L. Chuang, Tarek M. Habashy, L. Tsang, M. A. Zuniga, Q. Gu, H.-Z. Wang, X. Xu, H. Chuang et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 75-79 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33355# Massachusetts Inst. of Tech., Cambridge.
OPTICAL PROPAGATION AND COMMUNICATION
Jeffrey H. Shapiro, R. H. Rediker, P. Kumar, P. L. Bogler, R. S. Bondurant, F. Hakimi, M. W. Maeda, M. B. Mark, P. L. Mesite, and T. T. Nguyen *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 119-124 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33356# Massachusetts Inst. of Tech., Cambridge.
COMMUNICATION NETWORKS
R. S. Kennedy, S. S. Wagner, and E. B. Sia *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 125-127 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33357# Massachusetts Inst. of Tech., Cambridge.
DIGITAL SIGNAL PROCESSING
A. V. Oppenheim, A. B. Baggeroer, J. S. Lim, B. R. Musicus, D. R. Mook, G. L. Duckworth, T. E. Bordley, S. R. Curtis, D. S. Deadrick, W. P. Dove et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 129-145 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33358# Massachusetts Inst. of Tech., Cambridge.
SPEECH COMMUNICATION
Kenneth N. Stevens, J. Allen, M. Halle, S. J. Keyser, Victor W. Zue, Z. Andrade, D. Bradley, Martha Danly (Wang Labs., Inc.), F. Grosjean (Northeastern Univ.), S. Hawkins (Haskins Labs.) et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 147-157 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33359# Massachusetts Inst. of Tech., Cambridge.
LINGUISTICS
A. N. Chomsky, J. A. Fodor, M. F. Garrett, K. L. Hale, Morris Halle, J. W. Harris, S. J. Keyse, R. P. V. Kiparsky, J. R. Ross, and D. Archangeli *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 159-167 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-32670 Oklahoma Univ., Norman.
MULTI-VALUED LSI/VLSI LOGIC DESIGN Ph.D. Thesis
Krayim Santrakul 1983 245 p
Avail: Univ. Microfilms Order No. DA8404568

A procedure for synthesizing any large complex logic system, such as LSI and VLSI integrated circuits is described. This scheme uses Multi-Valued Multi-plexers (MVMUX) as the basic building blocks and the tree as the structure of the circuit realization. Simple built-in test circuits included in the network (the main current), provide a thorough functional checking of the network at any time. In brief, four major contributions are made: (1) multi-valued Algorithmic State Machine (ASM) chart for describing an LSI/VLSI behavior; (2) a tree-structured multi-valued multiplexer network which can be obtained directly from an ASM chart; (3) a heuristic tree-structured synthesis method for realizing any combinational logic with minimal or nearly-minimal MVMUX; and (4) a hierarchical design of LSI/VLSI with built-in parallel testing capability.
Dissert. Abstr.

N84-32671 Department of the Navy, Washington, D. C.
METHOD FOR MAKING JOSEPHSON JUNCTIONS WITH CONTAMINATION-FREE INTERFACES UTILIZING A ZNO CONTACT INSULATOR Patent
E. J. Cukauskas, inventor (to Navy) Issued 27 Mar. 1984 9 p Supersedes AD-D010140
(AD-D011057; US-Patent-4,439,269; US-Patent-Appl-SN-431977; US-Patent-Class-156-643) Avail: US Patent & Trademark Office CSCL 09/1

A method of fabricating Josephson junction integrated circuits in which the active layers are deposited within an ultra-high vacuum system during a single pumpdown of the system. Subsequent anisotropic etching defines the devices by etching away complete layers in some areas so as to isolate the Josephson junction device.
Author (GRA)

N84-32672 Department of the Air Force, Washington, D.C.
UNIVERSAL CONTROL GRID MODULATOR Patent
D. G. Miller, inventor (to Air Force) Issued 12 Jun. 1984 9 p Supersedes AD-D009630
(AD-D011108; US-Patent-4,454,430; US-Patent-Appl-SN-379807; US-Patent-Class-307-265) Avail: US Patent & Trademark Office CSCL 09/6

High voltage FET's (Field Effect Transistors) are used to modulate a traveling wave tube, which makes it possible to achieve fast rise, fall and delay characteristics, and very long pulsewidths to CW because of their low drive requirements to maintain the on condition. The low and high voltage portions of the modulator are coupled via special transformers having only one or two turns for each winding on torroidal cores. Since such transformers are not adequate for long pulse widths, the gate to source capacitance of a high voltage FET is charged with a short pulse from one transformer and held there by a blocking diode until it is removed by the off drive. To obtain pulse widths all the way out to CW, a regeneration circuit is incorporated in the low voltage circuitry so that if the commanded on time goes beyond a maximum time, successive pulses are generated to maintain the voltage between gate and source of the on FET.
GRA

N84-32673 Department of the Air Force, Washington, D.C.
PROGRAMMABLE SIGNAL PROCESSING DEVICE Patent
R. A. Belt and G. D. Couturier, inventors (to Air Force) Issued 12 Jun. 1984 8 p Supersedes AD-D009196
(AD-D011109; US-Patent-4,454,590; US-Patent-Appl-SN-315599; US-Patent-Class-364-724) Avail: US Patent & Trademark Office CSCL 09/5

The device performs a function for image processing, where W; are fixed weights for any specific application. It uses a PROM and accumulator algorithm, in which the memory stores the values. In 2(M) words, with addresses formed from one bit of each data word in a given bit position. In operation the most significant bit of each data word is used first to address memory, and in successive clock cycles the other bit positions are used down to the least significant. The memory output words are supplied to the adder-accumulator, and in each clock cycle the adder-accumulator output is shifted left one bit and used as a second input thereof. Then if the data words have N bits designated j=0 to N-1, after N clock cycles the memory output words have each been effectively multiplied by 2(J) and accumulated in the sum.
Author (GRA)

N84-32674 Department of the Navy, Washington, D. C.
CASCADED ADAPTIVE LOOPS Patent
B. L. Lewis and F. F. Kretschmer, Jr., inventors (to Navy) Issued 27 Mar. 1984 7 p
(AD-D011116; US-Patent-4,439,770; US-Patent-Appl-SN-696620; US-Patent-Class-343-381) Avail: US Patent & Trademark Office

CSCL 17/4

Document describes a sidelobe-cancellar system for canceling jamming interference signals from a radar signal includes serially cascaded cancellation channels utilizing preprocessing cancellers and main-channel cancellers. The last serially cascaded cancellation channel includes terminal preprocessing cancellers and terminal main-channel cancellers. The preprocessing is improved by the use of AGC circuits connected one each between the terminal preprocessing cancellers and terminal main-channel cancellers to stabilize the gain of the terminal main-channel cancellers, thus improving the cancellation ratio and transient response of the system. Author (GRA)

N84-32675 Department of the Navy, Washington, D. C.
GROUNDING RING FOR SHIELDED CABLE Patent
G. G. Deel, inventor (to Navy) Issued 1 May 1984 4 p
(AD-D011135; US-Patent-4,445,733; US-Patent-Appl-SN-389191; US-Patent-Class-33914R) Avail: US Patent & Trademark Office CSCL 09/1

The device uses a grounding ring, having both an outer and an inner ring element combination, which is placed about a shielded cable to be grounded. The inner ring has a multitude of grounding spikes cammed to move in a radially inward direction in response to rotation of the outer ring and pierce any outer insulation and the metal shielding sufficiently to make good electrical contact with the cable shielding about its circumferences. GRA

N84-32676 Department of the Navy, Washington, D. C.
DIGITAL MULTI-TAPPED DELAY LINE WITH AUTOMATIC TIME-DOMAIN PROGRAMMING Patent
A. G. Findeisen, L. L. Mellenbruch, and W. D. Lentz, inventors (to Navy) Issued 17 Apr. 1984 8 p Supersedes AD-D008905
(AD-D011136; US-Patent-4,443,765; US-Patent-Appl-SN-303448; US-Patent-Class-328-55) Avail: US Patent & Trademark Office CSCL 09/1

This application describes a single-input, multiple-output device which enables an electrical signal to be automatically delayed in accordance with irregularly spaced synchronization pulses. The device employs a plurality of first-in, first out (FIFO) shift registers energized in inverse order by the clocked outputs of a series of conventional shift registers. The signal to be delayed is stored in the FIFO registers and read out in accordance with the sequence of synchronization pulses provided to the conventional registers. Author (GRA)

N84-32677*# Sperry Flight Systems, Phoenix, Ariz.
CONCEPTUAL DESIGN OF A NONCONTACTING POWER TRANSFER DEVICE FOR THE ASPS VERNIER SYSTEM Final Report
J. Kroeger, J. Drilling, and T. Gunderman Hampton, Va. NASA. Langley Research Center Apr. 1984 164 p
(Contract NAS1-16909)
(NASA-CR-172238; NAS 1.26:172238) Avail: NTIS HC A08/MF A01 CSCL 09C

The conceptual of electrical power transfer across a magnetically controlled gap as discussed for several years. The design represents the culmination of the first serious attempt to design a very low force, noncontracting power transfer mechanism. The electromagnetic device advanced herein is an ironless, translatable secondary transformer in which one of the two coils is fixed to the entire magnetic core. The second coil is free to move within the core over the full range of motions required. The specific application considered for this design was the Vernier subsystem of the Annular Suspension and Pointing System (ASPS). The development of and rationale for the electromagnetics design is presented. Similar documentation is provided for the Electronics Design. The Appendices detail the results of small scale model tests, disturbance force calculations, the baseline transformer fabrication drawings, the AVS Converter Parts List, and model schematic diagrams. Author

N84-32678*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. Dept. of Electrical Engineering.
A STUDY OF THE HIGH FREQUENCY LIMITATIONS OF SERIES RESONANT CONVERTERS Technical Report, 1 Sep. 1981 - 31 Aug. 1982
Thomas A. Stuart and Roger J. King 20 Sep. 1982 78 p refs (Grant NsG-3281)
(NASA-CR-173868; NAS 1.26:173868) Avail: NTIS HC A05/MF A01 CSCL 09C

A transformer induced oscillation in series resonant (SR) converters is studied. It may occur in the discontinuous current mode. The source of the oscillation is an unexpected resonant circuit formed by normal resonance components in series with the magnetizing inductance of the output transformers. The methods for achieving cyclic stability are: to use a half bridge SR converter where $q<0.5$. Q should be as close to 1.0 as possible. If $0.5<q>1.0$, the instability will be avoided if $pai<2/3q-1/3$. The second objective was to investigate a power field effect transistor (FET) version of the SR converter capable of operating at frequencies above 100 KHz, to study component stress and losses at various frequencies. S.B.

N84-32679*# Naticnal Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CORRECTION OF ABERRATIONS COMPUTED IN THE APERTURE PLANE OF MULTIFREQUENCY MICROWAVE RADIOMETER ANTENNAS
R. F. Schmidt May 1984 69 p refs
(NASA-TM-86090; Rept-84F0267; NAS 1.15:86090) Avail: NTIS HC A04/MF A01 CSCL 14B

An analytical/numerical approach to identifying and correcting the aberrations introduced by a general displacement of the feed from the focal point of a single offset paraboloid antenna used in deployable radiometer systems is developed. A 15 meter reflector with 18 meter focal length is assumed for the analysis, which considers far field radiation pattern quality, focal region fields, and aberrations appearing in the aperture plane. The latter are obtained by ray tracing in the transmit mode and are expressed in terms of optical notation. Attention is given to the physical restraints imposed on corrective elements by real microwave systems and to the intermediate near field aspects of the problem in three dimensions. The subject of wave fronts and caustics in the receive mode is introduced for comparative purposes. Several specific examples are given for aberration reduction at eight beamwidths of scan at a frequency of 1.414 GHz. Author

N84-32680*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MEASUREMENT AMPLIFIER Patent Application
F. E. Lukens, inventor (to NASA) (Martin Marietta Aerospace, Denver) Filed 7 Aug. 1984 13 p Sponsored by NASA
(NASA-Case-MFS-25868-1; NAS 1.71:MFS-25868-1; US-Patent-Appl-SN-638584) Avail: NTIS HC A02/MF A01 CSCL 09A

A high common mode rejection differential amplifier wherein two serially arranged Darlington amplifier stages are employed and any common mode voltage is divided between them by a resistance network is described. The input to the first Darlington amplifier stage is coupled to a signal input resistor via an amplifier which isolates the input and presents a high impedance across this resistor. The output of the second Darlington stage is transposed in scale via an amplifier stage which has in its input a biasing circuit which effects a finite biasing of the two Darlington amplifier stages. NASA

N84-32681*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORECASTING OF HIGH VOLTAGE INSULATION PERFORMANCE: TESTING OF RECOMMENDED POTTING MATERIALS AND OF CAPACITORS
Renate S. Bever Aug. 1984 186 p refs
(NASA-TM-85536; X-711-84-16; NAs 1.15:85536) Avail: NTIS HC A09/MF A01 CSCL 09A

Nondestructive high voltage test techniques (mostly electrical

methods) are studied to prevent total or catastrophic breakdown of insulation systems under applied high voltage in space. Emphasis is on the phenomenon of partial breakdown or partial discharge (P.D.) as a symptom of insulation quality, notably partial discharge testing under D.C. applied voltage. Many of the electronic parts and high voltage instruments in space experience D.C. applied stress in service, and application of A.C. voltage to any portion thereof would be prohibited. Suggestions include: investigation of the ramp test method for D.C. partial discharge measurements; testing of actual flight-type insulation specimen; perfect plotting resin samples with controlled defects for test; several types of plotting resins and recommendations of the better ones from the electrical characteristics; thermal and elastic properties are also considered; testing of commercial capaciters; and approximate acceptance/rejection/rerating criteria for sample test elements for space use, based on D.C. partial discharge. B.G.

N84-32682*# Michigan State Univ., East Lansing. Coll. of Engineering.

SPATIAL ELECTRON DENSITY AND ELECTRIC FIELD STRENGTH MEASUREMENTS IN MICROWAVE CAVITY EXPERIMENTS

M. Peters, J. Rogers (Lincoln Lab., MIT), S. Whitehair, J. Asmussen, and R. Kerber [1984] 6 p refs

(Grant NAG3-305)

(NASA-CR-173907; NAS 1.26:173907) Avail: NTIS HC A02/MF A01 CSCL 09C

Measurements of electron density and electric field strength have been made in an argon plasma contained in a resonant microwave cavity at 2.45 GHz. Spatial measurements of electron density, n sub e, are correlated with fluorescence observations of the discharge. Measurements of n sub e were made with Stark broadening and compared with n sub 3 calculated from measured plasma conductivity. Additional measurements of n sub 3 as a function of pressure and in mixtures of argon and oxygen are presented for pressures from 10 Torr to 1 atm. Measurements in flowing gases and in static systems are presented. In addition, limitations of these measurements are identified. Author

N84-32683*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PROCEEDINGS OF THE FLAT-PLATE SOLAR ARRAY PROJECT RESEARCH FORUM ON THE DESIGN OF FLAT-PLATE PHOTOVOLTAIC ARRAYS FOR CENTRAL STATIONS

1983 316 p refs Forum held in Sacramento, Calif., 5-8 Dec. 1983

(Contract DE-AI01-76ET-20356)

(NASA-CR-173918; JPL-5101-247; JPL-Pub-84-44; DOE/JPL-1012-98; NAS 1.26:173918) Avail: NTIS HC A14/MF A01 CSCL 09C

The Flat Plate Solar Array Project, focuses on advancing technologies relevant to the design and construction of megawatt level central station systems. Photovoltaic modules and arrays for flat plate central station or other large scale electric power production facilities require the establishment of a technical base that resolves design issues and results in practical and cost effective configurations. Design, qualification and maintenance issues related to central station arrays derived from the engineering and operating experiences of early applications and parallel laboratory reserch activities are investigated. Technical issues are examined from the viewpoint of the utility engineer, architect/engineer and laboratory researcher. Topics on optimum source circuit designs, module insulation design for high system voltages, array safety, structural interface design, measurements, and array operation and maintenance are discussed. For individual titles, see N84-32684 through N84-32706.

N84-32684*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SOURCE-CIRCUIT DESIGN OVERVIEW

R. G. Ross, Jr. *In its* Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 7-14 refs (For primary document see N84-32683 22-33)

Avail: NTIS HC A14/MF A01 CSCL 09C

The source circuit is the fundamental electrical building block of a

The source circuit is the fundamental electrical building block of a large central-station array; it consists of a series-parallel network generally made up of a large number of parallel source circuits. Source-circuit electrical configuration is driven by a number of design considerations, which must be considered simultaneously. Array fault tolerance and hot spot heating endurance are examined in detail. M.A.C.

N84-32685*# Acurex Corp., Mountain View, Calif.

SOURCE-CIRCUIT DESIGN WITH MULTIPLE PHOTOVOLTAIC MANUFACTURERS

Robert Spencer *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 15-18 (For primary document see N84-32683 22-33)

Avail: NTIS HC A14/MF A01 CSCL 09C

The problems associated with source circuit design for use in photovoltaic (PV) hardware of different manufacturers or processes are discussed. The varying performance of dissimilar materials is examined and the need for standardization of equipment and performance output is investigated. M.A.C.

N84-32686*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

HOT-SPOT HEATING IN CENTRAL-STATION ARRAYS

C. C. Gonzalez *In its* Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 19-36 (For primary document see N84-32683 22-33)

Avail: NTIS HC A14/MF A01 CSCL 09C

Hot spot tests performed on the Sacramento Municipal Utility District (SMUD) verificaton array show that current imbalance occurs, resulting in significant hot spot heating. One cause of current imbalance is differences in the average shunt resistances of parallel cell strings due to cell shunt resistance variations. In depth hot spot tests are performed on the verification array with bypass diodes. The tests had several objectives: (1) a comparison of hot spot temperatures achieved under field conditions with those obtained with the present laboratory hot spot test using similar modules; (2) an assessment of current imbalance versus cross tie frequency; and (3) an assessment of different shadow patterns and shadow densities. Instrumented modules are used to vary the number of cross ties and to measure the test-cell current and back-bias voltage. The widths, lengths, and densities of the shadows are varied to maximize the back bias voltage at maximum power current. An infrared camera is used to indicate the existence of hot spots and estimate temperature increases in conjunction with thermocouples. The results of these hot spot tests indicate a sensitivity of back bias heating to the shadow size (amount of cell coverage) and density. M.A.C.

N84-32687*# ARCO Solar, Inc., Woodland Hills, Calif.

HOT-SPOT INVESTIGATIONS OF UTILITY SCALE PANEL CONFIGURATIONS

J. C. Arnett, R. B. Dally, and J. P. Rumburg *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1984 p 37-48 (For primary document see N84-32683 22-33)

Avail: NTIS HC A14/MF A01 CSCL 09C

The causes of array faults and efforts to mitigate their effects are examined. Research is concentrated on the panel for the 900 kw second phase of the Sacramento Municipal Utility District (SMUD) project. The panel is designed for hot spot tolerance without comprising efficiency under normal operating conditions. Series/paralleling internal to each module improves tolerance in the power quadrant to cell short or open circuits. Analtyical methods are developed for predicting worst case shade patterns and calculating the resultant cell temperature. Experiments conducted on a prototype panel support the analytical calculations. M.A.C

N84-32688*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
DESIGN AND SELECTION OF BYPASS DIODES
Neal F. Shepard, Jr. *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 49-49 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

Topics concerning the design and use of bypass diodes are investigated. Energy output, service life, safety, cell mounting approach, thermal capability, and cost analysis are also considered. M.A.C.

N84-32689*# BDM Corp., Albuquerque, N. Mex.
A REVIEW AND SUMMARY OF CELL AND MODULE MISMATCH LOSSES FROM THEORETICAL AND EXPERIMENTAL STUDIES
Timothy J. Lambarski *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 61-79 refs (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

Studies on power loss due to photovoltaic (PV) cell and module parameter mismatch were reviewed. The losses result from the current voltage (I-V) characteristics of cells which vary over a manufactured lot. The peak power and the peak power I-V point vary from cell to cell. The largest parameter variation occurs in the cell photocurrent generation and the most significant loss occurs in series connections since all cells are essentially limited by the lowest photocurrent. Most theoretical studies address only photocurrent variation effects, which consider shunt and series resistance, ideality factor and saturation current to be comparatively insignificant. One study is identified which specifically configured the study of mismatch loss effects. Experimental results consist of estimates based on limited data not taken from specially configured tests. E.A.K.

N84-32690*# Battelle Columbus Labs., Ohio.
SOURCE CIRCUIT DESIGN CONSIDERATIONS
G. T. Noel *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 81-90 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

The cost of several circuit configurations for large (5MW) array fields were investigated to assess the relative costs of high and low voltage configurations. Three source circuit NOC voltages were evaluated: 400V (ungrounded), 800V (+ or 400V center grounded), and 2000V (+ or - 1000V center grounded). Four source circuit configurations were considered for each of the three NOC voltages. The configurations correspond to source circuit currents of 15, 30, 45, and 60 amperes, respectively. Conceptual layouts for 5MW building blocks for each of the above configurations were developed. The designs were optimized to minimize BOS electrical and structural costs. Only the BOS electrical costs were evaluated. The designs were broken down into the following elements for cost: (1) basic source circuit intermodule wiring, bypass diodes and associated hardware, source circuit to J-Box wiring, etc; (2) J-Box blocking diodes, varistors, heat sinks, and housing; (3) disconnects source circuit disconnects, fuses, and housing; (4) bus cabling J-Box to PCU interface wiring, and trenching; (5) interface bus bar, group disconnects, and fuses; and (6) fault detection shunts, signal wire, electronics, and alarm. It is concluded that high voltage low current circuits are not economical, at higher currents high and low voltage circuit costs approach each other, high voltage circuits are not likely to offer near term advantage, and development work/manufacturer stimulation is needed to develop low cost high voltage hardware. E.A.K.

N84-32691*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRICAL INSULATION DESIGN REQUIREMENTS AND RELIABILITY GOALS
R. G. Ross, Jr. *In its* Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 95-104 refs (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

The solar cells in a photovoltaic module which must be electrically isolated from module exterior surfaces to satisfy a variety of safety and operating considerations are discussed. The performance and reliability of the insulation system are examined. Technical requirements involve the capability of withstanding the differential voltage from the solar cells to the module frame. The maximum system voltage includes consideration of maximum open circuit array voltages achieved under low-temperature, high-irradiance conditions, and transient overvoltages due to system feedback of lightning transients. The latter is bounded by the characteristics of incorporated voltage limiting devices such as MOVs. E.A.K.

N84-32692*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIPOT AND CONTINUITY QUALIFICATION EST EXPERIENCE
John S. Griffith *In its* Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 105-121 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

High voltage potential (Hipot) and module frame continuity tests are important parts of determining the suitability of solar modules for deployment into large arrays for electrical power production. Since field arrays operate at hundreds of volts above (or below) ground potential at some point in the field, it is necessary to assure adequate voltage isolation of the solar cell circuits. E.A.K.

N84-32693*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LABORATORY EXPERIENCE WITH VOLTAGE BREAKDOWN
G. R. Mon *In its* Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 123-146 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

Voltage breakdown failures in photovoltaic module electrical insulations lead to loss of entire source circuits and require costly maintenance and replacement. Avoiding such catastrophes requires that modules be designed so that voltage breakdown either never occurs or occurs so rarely that it affects the least life cycle energy costs insignificantly. To achieve this desired balance of cost and reliability, the module design engineer must understand the failure mechanisms and use data on materials and failue rates to suppress or retard them. Recently obtained failure mechanism information, rate data and materials property data and a qualitative model of module failure prediction are presented. E.A.K.

N84-32694*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
BREAKDOWN OF ORGANIC INSULATORS
Edward F. Cuddihy *In its* Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 147-154 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

Solar cells and their associated electrical interconnects and leads were encapsulated in transparent elastomeric materials. Their purpose in a photovoltaic module, one of the most important for these elastomeric encapsulation materials, is to function as electrical insulation. This includes internal insulation between adjacent solar cells, between other encapsulated electrical parts, and between the total internal electrical circuitry and external metal frames, grounded areas, and module surfaces. Catastrophic electrical breakdown of the encapsulant insulation materials or electrical current through these materials or module edges to external locations can lead to module failure and can create

hazards to humans. Electrical insulation stability, advanced elastomeric encapsulation materials are developed which are intended to be intrinsically free of in-situ ionic impurities, have ultralow water absorption, be weather-stable (UV, oxygen), and have high mechanical flexibility. Efforts to develop a method of assessing the life potential of organic insulation materials in photovoltaic modules are described. E.A.K.

N84-32695*# Aerospace Corp., El Segundo, Calif.
DC WIRING SYSTEM GROUNDING AND GROUND FAULT PROTECTION ISSUES FOR CENTRAL STATION PHOTOVOLTAIC POWER PLANTS c31
Edward J. Simburger *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 169-180 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 13B

The DC wiring system for a photovoltaic power plant presents a number of unique challenges to be overcome by the plant designers. There are a number of different configurations that the grounding of the DC wiring system can take, and the choice will affect the number and type of protective devices required to ensure safety of personnel and protection of equipment. The major grounding and fault protection considerations that must be taken into account when selecting the basic overall circuit configuration are summarized. The inherent advantages and disadvantages of each type of circuit grounding (resistance or solid) along with the personnel safety and equipment protection issues for each of these grounding methods are presented. Author

N84-32696*# Bechtel Corp., San Francisco, Calif.
PHOTOVOLTAIC SYSTEM GROUNDING AND FAULT PROTECTION
W. J. Stolte *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 181-186 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

The grounding and fault protection aspects of large photovoltaic power systems are studied. Broadly, the overlapping functions of these two plant subsystems include providing for the safety of personnel and equipment. Grounding subsystem design is generaly governed by considerations of personnel safety and the limiting of hazardous voltages to which they are exposed during the occurrence of a fault or other misoperation of equipment. A ground system is designed to provide a safe path for fault currents. Metal portions of the modules, array structures, and array foundations are used as a part of the ground system, provided that they and their interconnection are designed to be suitably reliable over the life of the plant. Several alternative types of fault protection and detection equipment are designed into the source circuits and dc buses feeding the input terminals of the subfield power conditioner. This design process requires evaluation of plausible faults, equipment, and remedial actions planned to correct faults. The evaluation should also consider life cycle cost impacts. Author

N84-32697*# Hughes Aircraft Co., Los Angeles, Calif.
ELECTRICAL SAFETY FOR HIGH VOLTAGE ARRAYS
Neil A. Marshall *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 187-196 ref (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

A number of key electrical safety requirements for the high voltage arrays of central station photovoltaic power systems are explored. The suitability of representative industrial DC power switchgear for control and fault protection was evaluated. Included were AC/DC circuit breakers, electromechanical contactors and relays, load interruptors, cold disconnect devices, sectionalizing switches, and high voltage DC fuses. As appropriate, steady state and transient characteristics were analyzed. Failure modes impacting upon operation and maintenance safety were also identified, as were the voltage withstand and current interruption levels. Author

N84-32698*# Acurex Corp., Mountain View, Calif.
GROUNDING AND FAULT PROTECTION OF THE SMUD PVI ARRAY
Dan Rosen *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 197-203 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

If large terrestrial photovoltaic (PV) power plants are to provide an economic source of generation, low-cost, reliable and easily maintainable systems must be developed. In addition, if the system is to be a central station powerplant owned and operated by an electric utility, the design must also be consistent with utility specifications and design standards. The particular solutions developed to address these issues, with regard to grounding and fault protection, for the first phase of the Sacramento Municipal Utility District's (SMUD) 100 mw(ac) PV powerplant are presented. This plant, known as PV1, is nominally rated at 1 mw(ac) and is scheduled to be in operation by the spring of 1984. Author

N84-32699*# Black and Veatch Consulting Engineers, Kansas City, Mo.
PHOTOVOLTAIC CENTRAL STATION STEP AND TOUCH POTENTIAL CONSIDERATIONS IN GROUNDING SYSTEM DESIGN
Gary Engmann *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 205-215 refs (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

The probability of hazardous step and touch potentials is an important consideration in central station grounding system design. Steam turbine generating station grounding system design is based on accepted industry practices and there is extensive in-service experience with these grounding systems. A photovoltaic (PV) central station is a relatively new concept and there is limited experience with PV station grounding systems. The operation and physical configuration of a PV central station is very different from a steam electric station. A PV station bears some similarity to a substation and the PV station step and touch potentials might be addressed as they are in substation design. However, the PV central station is a generating station and it is appropriate to examine the effect that the differences and similarities of the two types of generating stations have on step and touch potential considerations. Author

N84-32700*# Acurex Corp., Mountain View, Calif.
INTERFACE STANDARDIZATION
Robert Spencer and Vernon Wong *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 221-225 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

Central-station applications create a large and attractive market for photovoltaics in the near future. However, some significant barriers lie between the industry of today and realization of that market. Manufacturing capacity and price are two principal impediments. The Utilities, which are the future system owners, are gaining experience with central-station PV power through the Sacramento Municipal Utility District, Hesperia and similar small central-station installations. SMUD has recognized that competition must be maintained to help reduce prices. So little standardization exists that the cost is driven upward to redefine mechanical and electrical interfaces for each vendor. New structues are required for each vendor and nonoptimum field geometries result from attempts to include more than one vendor in an array field. Standards at some hardware level are required. Author

N84-32701*# ARCO Solar, Inc., Woodland Hills, Calif.
EVOLUTION OF INTEGRATED PANEL STRUCTURAL DESIGN

AND INTERFACES FOR PV POWER PLANTS
J. C. Arnett, A. J. Anderson, and R. E. Robertson *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 227-233 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

The evolution of integrated photovoltaic (PV) panel design at ARCO Solar is discussed. Historically, framed PV modules of about 1 x 4-ft size were individually mounted in the field on fixed support structures and interconnected electrically with cables to build higher-power arrays. When ARCO Solar saw the opportunity in 1982 to marry its PV modules with state-of-the-art heliostat trackers developed by ARCO Power Systems, it became obvious that mounting individual modules was impractical. For this project, the framed modules were factory-assembled into panels and interconnected with cables before being mounted on the trackers. Since then, ARCO Solar made considerable progress and gained substantial experience in the design and fabrication of large PV panels. Constraints and criteria considered in these design activities included static and dynamic loads; assembly and transportation equipment and logistics, structural and electrical interfaces, and safety and grounding concerns. R.J.F.

N84-32702*# Solarex Corp., Rockville, Md.
IS STRUCTURAL INTERFACE STANDARDIZATION BENEFICIAL?
W. E. Dombert *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 235-245 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

Factors applicable to fixed angle, large field and fixed angle, large building flat plate photovoltaic (PV) generator arrays are discussed in the context of standardization. It is concluded that structural interface standardization may be highly desirable in any one major project, but not at this time in the overall PV industry. Attempts to mandate such standardization will act as a deterrent to long-range improvements. In specific projects, structural standardization should be defined at the largest practical interface, leaving the maximum possible freedom to the module and array manufacturer. There is a corollary area, however, where detailed standards would benefit the industry; the matter of Standard Practices. Work being done towards definition of acceptable/desirable practices in materials, finishes, fastening and locking methods, grounding techniques, lightning protection, etc., and in handling the environmental ranges, should be continued. R.J.F.

N84-32703*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
QUALIFICATION TESTS AND ELECTRICAL MEASUREMENTS: PRACTICE AND PROBLEMS
Melvin I. Smokler *In its* Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 257-264 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

As part of the Flat-Plate Solar Array Project, 138 different module designs were subjected to qualification tests. Electrical measurements were subjected on well over a thousand modules representing more than 150 designs. From this experience, conclusions are drawn regarding results and problems, with discussion of the need for change or improvement. The qualification test sequence incuded application of environmental and electrical stresses to the module. With few exceptions, the tests have revealed defects necessitation of environmental and electrical stresses to the module. With few exceptions, the tests have revealed defects necessitating module design or process changes. However, the continued need for these tests may be questioned on the basis of technical and logistical factors. Technically, the current test sequence does not cover all design characteristics, does not include all field conditions and is not known to represent the desired 30-year module life. Logistically, the tests are time-consuming and costly, and there is a lack of, fully qualified independent test organizations. Alternatives to the current test program include simplification based on design specification and site environment, and/or the use of warranties or other commercial practices. R.J.F.

N84-32704*# Hughes Aircraft Co., Long Beach, Calif.
QUALIFICATION AND TESTING OF MODULES
Dean B. Cohen *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 265-276 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

The experience gained in procuring solar modules soon to be installed on the Photovoltaic Higher Education National Exemplar Facility (PHENEF) at Georgetown University is discussed. The 300 KE Photovoltaic Array consists of 4464, 2' X 4', polycrystalline solar cell modules. The performance requirements for the modules are described in a detailed procurement specification which defines physical and electrical characteristics and extensive quality assurance provisions including requirements for an interface control drawing and qualification and acceptance testing. R.J.F.

N84-32705*# ARCO Solar, Inc., Woodland Hills, Calif.
QUALIFICATION TESTING AND ELECTRICAL MEASUREMENT EXPERIENCE: A MANUFACTURER'S VIEW
J. C. Arnett, J. E. Cooley, and T. L. Wingert *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 277-281 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

ARCO Solar's experiences as a participant in an industry-utility-government environmental qualification team examining photovoltaic devices are discussed. Included is an assessment of the applicability, completeness and appropriateness of the testing procedures and of the acceptance criteria for megawatt-sized procurements for utilities. Like the stand-alone users, the utility industry is interested in obtaining low costs, but additional concerns exist related to reliability and durability, safety, grounding and overall system criteria including performance prediction (related to output power acceptance testing), power quality and dispatchability. For purposes of this first major purchase of photovoltaic modules and panels by the utility industry, there was a carry-over of the JPL specifications. The need exists for futher development, assessement, and selection of qualification and testing standards and evaluation criteria specifically addressing these additional concerns for utility-connected PV power-plant applications. R.J.F.

N84-32706*# BDM Corp., Albuquerque, N. Mex.
QUALIFICATION TESTING FOR A CENTRAL STATION
Donald L. Forrester *In* JPL Proc. of the Flat-Plate Solar Array Proj. Res. Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Sta. 1983 p 283-299 (For primary document see N84-32683 22-33)
Avail: NTIS HC A14/MF A01 CSCL 09C

Qualification testing for a Central Station Photovoltaic (PV) Facility depends to a great extent on the system design, (fixed versus tracking), and the level of data acquisition/control which is incorporated into the system. The basic elements which require qualification tests include: dc power production/collection; tracker conversion systems; ac utility interface; system level control; and data acquisition/reporting. The qualification tests from the Lungo (ARCO) 1 MW Facility which were completed in January 1983 are discussed. The philosophy and many of the procedures are applicable to any central station PV facility. R.J.F.

N84-32707*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
ANALYSIS, TESTING, AND EVALUATION OF FAULTED AND UNFAULTED WYE, DELTA, AND OPEN DELTA CONNECTED ELECTROMECHANICAL ACTUATORS Final Report
Thomas W. Nehl and N. A. Demerdash Jul. 1983 235 p refs (Contract NAS9-16281)
(NASA-CR-171808; NAS 1.26:171808) Avail: NTIS

HC A11/MF A01 CSCL 09A

Mathematical models capable of simulating the transient, steady state, and faulted performance characteristics of various brushless dc machine-PSA (power switching assembly) configurations were developed. These systems are intended for possible future use as primemovers in EMAs (electromechanical actuators) for flight control applications. These machine-PSA configurations include wye, delta, and open-delta connected systems. The research performed under this contract was initially broken down into the following six tasks: development of mathematical models for various machine-PSA configurations; experimental validation of the model for failure modes; experimental validation of the mathematical model for shorted turn-failure modes; tradeoff study; and documentation of results and methodology. DOE

N84-32708# Ball Aerospace Systems Div., Boulder, Colo.
MONOLITHIC INTEGRATED ANTENNA SYSTEMS Final Report, Aug. 1980 - Feb. 1984
P. J. Burlingame and R. J. Stockton 8 Jun. 1984 9 p
(Contract DAAG29-80-C-0132)
(AD-A143184; ARO-16813.1-EL) Avail: NTIS HC A02/MF A01 CSCL 09/5

A 4 x 4, 17.5 GHz Monolithic Phased Array fabricated on high resistivity silicon is described. This approach combines microstrip antenna elements, beam lead PIN diodes and silicon integrated circuit technology to replace labor intensive hybrid circuit construction techniques with low cost, repeatable integrated circuit processes. Preliminary test data from two hardware iterations is presented. Although the program is formally concluded, additional testing is still being conducted to characterize overall performance. Author (GRA)

N84-32709# California Univ., Berkeley. Electronics Research Lab.
RESEARCH IN MONOLITHIC, SIGNAL-PROCESSING CIRCUITS Final Report, 1 Sep. 1980 - 30 Apr. 1984
R. G. Meyer and D. O. Pederson Apr. 1984 7 p
(Contract DAAG29-80-K-0067)
(AD-A143204; ARO-17433.5-EL) Avail: NTIS HC A02/MF A01 CSCL 09/5

Research results in monolithic signal processing circuits are described. New topologies were devised for low-noise monolithic voltage-controlled oscillators leading to measured performance eighty times better than previously reported. A new theory describing start-up and steady state in monolithic crystal oscillators was devised and used to realize a one-pin crystal oscillator. A new all-MOS analog multiplier was synthesized, fabricated, and measured to have performance comparable to more mature bipolar versions, while consuming much less silicon area. Author (GRA)

N84-32710# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
DC (DIRECT-CURRENT) PARTIAL-DISCHARGE-ENVIRONMENTAL SCREENING OF SPACE TWTS (TRAVELING WAVE TUBES) Technical Report
F. Hai and K. W. Paschen 4 Jun. 1984 24 p
(Contract F04701-83-C-0084)
(AD-A143230; TR-0084(4935-10)-1; SD-TR-83-72) Avail: NTIS HC A02/MF A01 CSCL 09/1

Direct-current partial discharge/environmental tests are being conducted on traveling wave tubes (TWTs) designated for long-term space operation to screen out tubes with high-voltage defects. Two types of TWTs with different external high-voltage insulation are being examined: (1) TWTs with polymeric potting, and (2) TWTs with ceramic feedthroughs. GRA

N84-32711# JAYCOR, Alexandria, Va.
PLASMA SWITCH DEVELOPMENT Final Report, 26 Feb. 1982 - 25 Feb. 1984
Robert J. Commisso 8 Jun. 1984 184 p
(Contract N00014-82-C-2114)
(AD-A143233; AD-E750949; JAYCOR-J206-84-008/6220) Avail: NTIS HC A09/MF A01 CSCL 20/7

The work relates to two opening switch concepts that may be applied to inductive store/pulse compression techniques for various pulsed power applications. The opening switch concepts that are the subject of this final report are the electron-beam controlled switch and the plasma dynamic switch. GRA

N84-32712# Rice Univ., Houston, Tex. Dept. of Psychology.
OPTIONAL STOPPING PERFORMANCE UNDER GRAPHIC AND NUMERIC CRT FORMATTING
D. R. Schwartz and W. C. Howell Jun. 1984 33 p
(Contract N00014-82-C-0001)
(AD-A143274; TR-84-1) Avail: NTIS HC A03/MF A01 CSCL 05/10

Two experiments sought to determine whether, and if so how, performance varies as a function of the manner in which a progressively unfolding decision problem is displayed over time. A hurricane-tracking scenario was adapted to the optional-stopping paradigm, such that subjects elected to continue sampling information or to make a terminal decision (evacuate or stay) at successive points in the storm's development based upon cumulative evidence and future expectations. The display manipulation was minimal in that it applied only to non-predictive historical data (position information). Despite this conservative test, display format had a significant effect when time pressure was involved: subjects reached earlier and better terminal decisions under the analog (graphic) than the numerical format (Experiment 2). The differences reduced to nonsignificances under self-pacing (Experiment 1), although significant improvements were obtained by use of a simple aiding device (calculation of worst case probabilities). Results are generally consistent with Hammond's Cognitive Consistency Theory. Author (GRA)

N84-32713# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
THREE-DIMENSIONAL CIRCUIT LAYOUTS Interim Research Report
T. Leighton and A. Rosenberg Jun. 1984 38 p
(Contract N00014-80-C-0622)
(AD-A143430; MIT/LCS/TM-262) Avail: NTIS HC A03/MF A01 CSCL 09/1

Recent advances in fabrication technology have rendered imminent the fabrication of multilayer chips, wafers and circuit boards. This paper examines the savings in material and communication time afforded by the development of three-dimensional technology. In particular, derived are close upper and lower bounds on the volume and maximum wire length with which circuits can be realized in a multilayer medium. For example, it is found that the smallest volume of any three-dimensional layout of an N-device circuit is no more than (roughly) (AN)1/2, where A is the smallest area of any two-dimensional layout of the circuit. It is also showing how to efficiently transform a two-dimensional layout of area A and maximum wire length L into a three-dimensional layout of volume (roughly) V = A/H and maximum wire length L = L/H for moderate numbers of layers H. Two noteworthy features of the study are: (1) that, within logarithmic factors, the indicated savings can be realized with layouts that use the third dimension only for interconnect; and (2) that the indicated savings can be realized algorithmically we present polynomial-time algorithms that transform a given two-dimensional layout into a more efficient three-dimensional layout. Author (GRA)

N84-32714# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
HIGH TEMPERATURE ELECTRONICS TECHNOLOGY Final Report, Apr. 1980 - Sep. 1983
J. C. Dening and D. E. Hurtle Mar. 1984 227 p
(Contract N00173-79-C-0010)
(AD-A143571; R83AEB637) Avail: NTIS HC A11/MF A01 CSCL 09/1

This report summarizes the barrier metallization developments accomplished in a program intended to develop 300 C electronic controls capability for potential on-engine aircraft engine application. In addition, this report documents preliminary life test results

at 300 C and above and discusses improved design practices required for high temperature integrated injection logic semiconductors. Previous Phase 1 activities focused on determining the viability of operating silicon semiconductor devices over the -55 C to +300 C temperature range. This feasibility was substantiated but the need for additional design work and process development was indicated. Phase 2 emphasized the development of a high temperature metallization system as the primary development need for high temperature silicon semiconductor applications. GRA

N84-32715# Department of the Air Force, Washington, D.C.
MACHINED TWO-PIECE MICROWAVE WAVEGUIDE Patent Application
M. J. Riley, inventor (to Air Force) Filed 8 Mar. 1984 11 p
(AD-D011088; US-Patent-Appl-SN-587432) Avail: NTIS HC A02/MF A01 CSCL 09/1

Machineable microwave waveguide apparatus and method for constructing same. Waveguide functions as an interconnecting waveguide channel between two parallel microwave ports which have an axial offset. The waveguide is comprised of two complimentary halves with C-shaped cross-section, the two halves fitting together to form a single unit. The fit-together unit is capped, and can be sealed for pressure-tight applications. Author (GRA)

N84-32716# Department of the Air Force, Washington, D.C.
COMPACT BROADBAND RECTANGULAR TO COAXIAL WAVEGUIDE JUNCTION Patent Application
J. C. Lee, inventor (to Air Force) Filed 11 Apr. 1984 12 p
(AD-D011091; US-Patent-Appl-SN-598949) Avail: NTIS HC A02/MF A01 CSCL 09/1

A compact waveguide junction for coupling rectangular waveguides of one frequency to a coaxial waveguide, and a second rectangular waveguide of a second frequency band to the interior of the hollow center conductor of the coaxial waveguide is described. GRA

N84-32717# Department of the Army, Washington, D. C.
TACTICAL HIGH FREQUENCY ARRAY ANTENNAS Patent Application
D. V. Campbell, P. W. Dubowicz, and F. K. Schwering, inventors (to Army) Filed 27 Jun. 1984 32 p
(AD-D011095; US-Patent-Appl-SN-624896) Avail: NTIS HC A03/MF A01 CSCL 09/5

A vertically polarized array comprised of both bottom fed and top fed configurations having a driven element comprising at least one but, when desirable, two generally horizontal wire conductor segments of a length substantially equal to one half the operating wavelength of the array and with the ends of the half-wave conductor segments being connected to or extending into generally vertical quarter wavelength wire conductor segments. In a bottom fed configuration the feedpoint is at the bottom end of one vertical quarter wavelength conductor segment while in a top fed configuration one vertical quarter wavelength segment comprises a quarter wavelength of coaxial transmission line having one end configured into signal isolation means, comprising a cable choke, while the feedpoint is located at the other end. Behind the array, located at a distance of substantially a quarter wavelength, is a parasitic reflector element comprising a substantially identical structure as the driven element with the lower ends of the vertical quarter wavelength elements thereof positioned a foot or two above the surface of the ground. Such an arrangement provides unidirectional radiation and reception at low take-off angles, e.g., 20 deg above the horizon. Author (GRA)

N84-32718# Department of the Air Force, Washington, D.C.
SOLDERING METHOD FOR CABLE CONNECTORS Patent Application
L. O. Blanchard, inventor (to Air Force) Filed 21 Mar. 1984 10 p
(AD-D011103; US-Patent-Appl-SN-592034) Avail: NTIS HC A02/MF A01 CSCL 09/1

The heat-sensitive components of cables and cable connectors are protected from overheating during vapor phase soldering by enclosing such components in a metal foil bag. Author (GRA)

N84-32719# Department of the Air Force, Washington, D.C.
BACKFIRE BIFILAR HELIX ANTENNA Patent Application
C. W. Webster, inventor (to Air Force) Filed 16 May 1984 15 p
(AD-D011118; US-Patent-Appl-SN-611060) Avail: NTIS HC A02/MF A01 CSCL 09/5

A backfire bifilar helix antenna is disclosed having two helically wound conductors made of coaxial cable wherein the two conductors comprise the shield portion of the cable. The coaxial cable of one of the conductors serves as a transmission line for supplying signals to the feed end of the antenna and has its center conductor connected to the shield of the other conductor cable. The nominal input impedance of the antenna may be adjusted to a desired value by conductive surface layers attached to the shield portion of the conductors at the feed end. Author (GRA)

N84-32720# Argonne National Lab., Ill.
LITHIUM-ALLOY/METAL SULFIDE BATTERY RESEARCH
L. Redey 1984 4 p refs Presented at 6th DOE Battery and Electrochem. Contractors' Conf., Washington, D.C., 25 Jun. 1984
(Contract W-31-109-eng-38)
(DE84-013427; CONF-840677-3) Avail: NTIS HC A02/MF A01

The results of measurements on small electrodes in the half cell experiments and on large electrodes (50 to 160 sq cm) in compact cell studies (ANL results reported in 1979 to 1982) were proven comparable in terms of area specific resistances of the electrode bed. Also, post test optical analysis showed comparable microstructure of the small and large electrodes. The measured area specific resistance and capacities of the ternary Li-Al-Si alloy and the iron and nickel sulfide electrodes with high sulfur activity indicate a possibility for designing a new generation of Li alloy/metal sulfide cells. With proper combination of the tested active materials and electrolytes, a 50 to 100% performance increase relative to the Li-Al/FeS cells can be expected. Cell designs are being developed to study the interaction of the positive and negative electrodes (capacity matching, self discharge) in small compact cells. DOE

N84-32721# Argonne National Lab., Ill.
EFFECTS OF STANDTIME ON THE AVAILABLE CAPACITY OF LEAD-ACID AND NICKEL/IRON ELECTRIC VEHICLE BATTERIES
W. H. DeLuca, A. F. Tummillo, R. L. Biwer, and N. P. Yao 1984 7 p refs Presented at Intersoc. Energy Conversion Engr. Conf., San Francisco, 19 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-013452; CoNF-840804-24) Avail: NTIS HC A02/MF A01

In electric vehicle (EV) applications, the battery load contains interruptions of various time durations. These standtimes must be understood to predict and optimize vehicle operation. The impact of various standtimes (0-4 h) at different depth of discharge (DOD) and state of charge (SOC) levels on the capacity retention of both improved lead-acid and nickel/iron (Ni/Fe) EV batteries were measured. It is shown that the Ni/Fe system exhibits a shelf discharge capacity loss immediately after charging that increases with both standtime and SOC. The self discharge rate decreases rapidly with standtime and discharging. Standtimes after charging also decrease the available capability of the lead acid system due to reduced battery temperatures. However, standtimes at DOD levels > 50% provide an increase in battery capacity by allowing for the relaxation of electrolyte concentration gradients. The test procedures used, test data and the results are discussed. DOE

N84-32722# Argonne National Lab., Ill.
THERMAL MANAGEMENT OF A LITHIUM/IRON-SULFIDE BATTERY
H. Shimotake, A. A. Chilenskas, R. F. Malecha, and N. P. Yao 1984 5 p refs Presented at Intersoc. Energy Conversion Engr. Conf., San Francisco, 19 Aug. 1984
(Contract W-31-109-eng-38)

(DE84-013438; CONF-840804-23) Avail: NTIS HC A02/MF A01

A thermal management design was completed for a Li-Al/FeS battery was analyzed. High efficiency thermal insulation is used to insulate the battery case which keeps heat loss to an acceptable level while maintaining the battery at its proper operating temperature of the battery during startup, normal operation, and standby duty. Computer assisted thermal modeling supported by experimental data show that the temperature uniformity of the cells in a 162 cell battery can be kept within 16 C under anticipated operating conditions. DOE

N84-32723# California Univ., Livermore. Lawrence Livermore Lab.

MECHANISMS OF ELECTRICAL CONDUCTIVITY IN OLIVINE

R. N. Schock, A. G. Duba, and T. J. Shankland (Los Alamos Scientific Lab., N. Mex.) 1984 13 p refs Presented at the 27th Intern. Geological Congr., Moscow, 4-14 Aug. 1984

(Contracts W-7405-eng-48; W-7405-eng-36)

(DE81-017313; LA-UR-83-2489; CONF-840820-1) Avail: NTIS HC A02/MF A01

The electrical conductivity and the thermoelectric effect in single crystals indicate that the charge conduction mechanism in pure magnesium forsterite is electrons. The concentration of electrons can be varied by controlling the number of oxygen vacancies through manipulation of the oxygen pressure. For iron bearing olivine, the conduction mechanism is by electron holes localized on an iron ion. Since iron strongly affects the creep process, it is suggested that oxidation of iron is accompanied by the production of magnesium vacancies. DOE

N84-32724# Oak Ridge National Lab., Tenn.

CURRENT ASSESSMENT OF THE POTENTIAL OF DIELECTRIC GAS MIXTURES FOR INDUSTRIAL APPLICATIONS

D. W. Bouldin, D. R. James, M. O. Pace, and L. G. Christophorou Apr. 1984 8 p refs Presented at 4th Intern. Symp. on Gaseous Dielec., Knoxville, Tenn., 29 Apr. 1984

(Contract DE-AC05-84OR-21400)

(DE84-011658; CONF-840403-2) Avail: NTIS HC A02/MF A01

The need for more efficient, economical electrical power transmission and distribution has given impetus to the investigation of new insulating gases. Since no single gas meets all of the multiple needs and operating conditions that exist in power apparatus, mixtures were studied with the goal of tailoring the dielectric for a specific application by exploiting the properties of the component gases. Research results on dielectric gas mixtures and assesses the potential of such mixtures for industrial applications are reviewed. The topics considered include electrical breakdown characteristics, physical and chemical properties, and economics. Author

N84-32725# Los Alamos Scientific Lab., N. Mex.

MAGNETIC SWITCHES AND CIRCUITS, REVISION 2

W. C. Nunnally May 1984 39 p refs

(Contract W-7405-eng-36)

(DE84-014141; LA-8862-MS-Rev-2) Avail: NTIS HC A03/MF A01

The use of saturable inductors as switches in lumped-element, magnetic-pulse compression circuits is outlined. The operation of the three basic types of magnetic pulse compression circuits is discussed and the characteristic use of each is defined. In addition, the geometric constraints and magnetic pulse compression circuits used in short-pulse, low-inductance systems are considered. The scaling of presaturation leakage currents, magnetic energy losses, and switching times with geometrical and material parameters are developed to aid in evaluating magnetic pulse compression systems in a particular application. Finally, a scheme for increasing the coupling coefficient in saturable stripline transformers is proposed to enable their use in the short-pulse, high-voltage regime. DOE

N84-32726# California Univ., Berkeley. Lawrence Berkeley Lab.

HIGH-INTENSITY DISCHARGE (HID) SOLID-STATE BALLAST PROGRAM: ENGINEERING DEVELOPMENT REPORT, PHASE 2

R. S. Carlson Dec. 1983 44 p refs

(Contract DE-AC03-76SF-00098)

(DE84-013882; LBL-17196) Avail: NTIS HC A03/MF A01

A high frequency (28 to 31(0)K Hz) electronic current source (ballast) designed to drive a 200 watt 100 volt sodium vapor gas discharge lamp is described. A resonant switching power amplifier system utilizing a novel constant power feedback loop is employed to maintain the lamp input power constant within two percent via changes due to lamp aging, etc. The lamp input power and therefore the light output is adjustable from 50 to 100 percent of rated power. A input (electronic filter) inverter, changes the 277 volts alternating voltage input to a regulated direct current (DC) voltage used to power the output stage. The inverter reflects, a essentially unity power factor load to the power input source at all times. DOE

N84-32727# Stanford Linear Accelerator Center, Calif.

A 1-DIMENSIONAL DISK MODEL SIMULATION FOR KLYSTRON DESIGN

Hiroshi Yonezawa and Yukio Okazaki May 1984 26 p refs Sponsored in part by The Ministry of Education, Science and Culture of Japan Prepared in cooperation with Toshiba Research and Development Center, Kawasaki, Japan

(Contract DE-AC03-76SF-00515)

(DE84-013793; SU-SLAC-TN-84-5) Avail: NTIS HC A03/MF A01

In 1982, a one dimensional, rigid disk model computer program <1> to serve as a reliable design tool for the 150 MW klystron development project was written. This is an introductory note for the users of this program. While reviewing the so called disk programs presently available, hypotheses such as gridded interaction gaps, a linear relation between phase and position, and so on, were found. These hypotheses bring serious limitations and uncertainties into the computational results. JPNDISK was developed to eliminate these defects, to follow the equations of motion as rigorously as possible, and to obtain self consistent solutions for the gap voltages and the electron motion. Although some inaccuracy may be present in the relativistic region, JPNDISK, in its present form, seems a most suitable tool for klystron design; it is both easy and inexpensive to use. DOE

N84-32728# California Univ., Livermore. Lawrence Livermore Lab.

LARGE APERTURE ELECTRO-OPTICAL SWITCH

J. Goldhar and M. A. Henesian 19 Dec. 1984 9 p refs Presented at the 13th Intern. Quantum Electron. Conf., Anaheim, Calif. 18-21 Jun. 1984

(Contract W-7405-eng-48)

(DE84-013089; UCRL-90154; CONF-840629-4) Avail: NTIS HC A02/MF A01

A transparent plasma electrode formed in low pressure ionized gas which acts as a conductive coating to allow the uniform charging of the optical faces of an electro-optic material is discussed. Experiments with large aperture Pockels cells up to 27 cm are in progress. It is shown that a variation of the preionization current changes the initial plasma resistance which effects the voltage and optical risetimes. A model for this dependence and scaling with aperture is discussed. DOE

N84-32729# Argonne National Lab., Ill.

RECENT RESULTS FROM THE NATIONAL BATTERY TEST LABORATORY

F. Hornstra and N. P. Yao 1984 4 p refs Presented at Intern. Soc. of Electrochem., Berkeley, Calif., 5 Aug. 1984

(Contract W-31-109-eng-38)

(DE84-012110; CONF-840853-5) Avail: NTIS HC A02/MF A01

The testing of EV batteries is the demanding and requires the most versatile test program. The National Battery Test Laboratory was established in 1977 and became operational in 1978. It is computer automated and operates around-the-clock. The facility has room for the simultaneous testing of about 76 batteries, each independently operated, under various environmental conditions and over a wide range of voltages and currents. The NBTL has

four major components as follows: (1) The control room and main test area where ambient and elevated temperature testing are conducted. (2) The environmental annex where low temperature chambers and a Zn/Cl test facility (with halogen scrubber) exist. (3) The Battery Components Technology Laboratory where special instrumentation and software are installed to allow systematic parametric variation and optimization and other refined studies. (4) The recently added high temperature test area where Li/S and Na/S cells are under evaluation. DOE

N84-32730# Argonne National Lab., Ill.
CHARACTERIZATION OF VOLTAGE LOSSES DURING HIGH-INTENSITY CURRENT PULSES IN REACTIVE, POROUS ELECTRODES OF MOLTEN SALT CELLS
L. Redey 1984 4 p refs Presented at Intern. Soc. of Electrochem., Berkeley, Calif., 5 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-012112; CONF-840853-4) Avail: NTIS HC A02/MF A01

A technique for the rapid characterization of the power-related properties of porous electrodes of molten salt cells has been developed. In this method, the electrode properties were investigated under one-dimensional current-distribution conditions in small test cells of 0.3 to 1.5 Ah capacity. The electrode potential was measured against a Ni/Ni3S2 or Li-Al reference electrode located so that the IR-voltage drop was eliminated. At different states of charge, galvanostatic discharge or charge current pulses of different intensity and duration were applied to the electrode by high-precision power sources. The state of charge for the electrode was determined from the quantity of the coulombs passed in galvanostatic cycling and is indicated here by the numeric value of x in the generic formula of the active material (e.g., x in FeS/sub x). Electrode materials iron sulfide, nickel sulfide, Li-Al and Li-Si alloys in LiCl-KCl and LiF-LiCl-LiBr molten salt electrolytes were investigated. DOE

N84-32731# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
GENERAL ENERGY BALANCE FOR BATTERY SYSTEMS
Dawn Bernardi, E. Pawlikowski, and John Newman Apr. 1984 43 p refs Presented at the Fall Meeting of the Electrochem. Soc., New Orleans, 17 Oct. 1984 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE84-013235; LBL-17776; CONF-841058-2) Avail: NTIS HC A03/MF A01

A general energy balance for battery systems was developed. This equation is useful for estimating cell thermal characteristics. Reliable predictions of cell temperature and heat generation rate are required for the design and thermal management of battery systems. The temperature of a cell changes as a result of electrochemical reactions, phase changes, mixing effects, and joule heating. The equation developed incorporates these effects in a complete and general manner. Simplifications and special cases are discussed. The results of applying the energy balance to a mathematical model of the LiAl/FeS cell discharged through two different reaction mechanisms are given as examples. The examples illustrate how the energy equation may be applied to a specific system to examine the relative contributions corresponding to the terms in the equation. The examples show that the processes involved in cell heat generation is advantageous. DOE

N84-32732# Sandia Labs., Albuquerque, N. Mex.
AMPULE TESTS TO SIMULATE GLASS CORROSION IN AMBIENT TEMPERATURE LITHIUM BATTERIES, VOLUME 2
S. C. Douglas, B. C. Bunker, C. C. Crafts, and R. K. Quinn Jun. 1984 70 p refs
(Contract DE-AC04-76DP-00789)
(DE84-014330; SAND-83-2301/2) Avail: NTIS HC A04/MF A01

Glass corrosion in battery headers were found to limit the shelf life of ambient temperature lithium batteries. Glass corrosion can lead to loss of battery electrolytes or to shorts across the conductive corrosion product. Tests were conducted which simulate the corrosive environment in a battery by sealing headers attached to lithium metal into Pyrex ampules containing battery electrolyte. Using the ampule test, glass corrosion kinetics have been determined at 70 C for the Li/SO2, Li/SOCl2, and Li/SOCl2 + BrCl battery systems. Test results indicate that corrosion of commercial glass compositions is extensive in all electrolytes tested, resulting in predicted battery failures after several months. Sandia's TA-23 glass corrodes at a much slower rate, indicating a projected battery lifetime of over five years in the LiSO2 system. Test results reveal that corrosion kinetics are sensitive to header polarization, stress, and configuration as well as glass composition. M.J.S.

N84-32733# Physical Sciences, Inc., Andover, Mass.
MOLTEN CARBONATE FUEL CELL PERFORMANCE MODEL UPDATE Quarterly Report, Oct. - Dec. 1983
G. Wilemski and N. H. Kemp Mar. 1984 59 p refs
(Contract DE-AC21-81FE-15078)
(DE84-012932; DOE/FE-15078/1613) Avail: NTIS HC A04/MF A01

A new porous electrode model, termed the heterogeneous film model, which is intended to be a reasonable depiction of ERC's ceramic coated Ni anodes and to serve as a first approximation to GE's and ANL's Ni/Cr anodes is described. In the model the electrode is pictured as a highly crosslinked three dimensional network of Ni or Ni/Cr filaments. The Ni or Ni/Cr is coated by a porous layer of ceramic or chromite. Most of the fine scale porosity of the electrode is found in the layer and most of the electrolyte resides in this layer which then forms a heterogeneous film on the Ni or Ni/Cr surface. The film coated Ni or Ni/Cr network is idealized as a random packing of short cylinders. The theoretical development of the model includes mathematical descriptions of ionic conduction, liquid phase diffusion through the heterogeneous film, and electrode kinetics on the Ni or Ni/Cr surface. The geometric parameters of the model are expressed in observable properties of the electrode. A mathematical analysis of the development of vertical concentration gradients in the gas flow channels is described. A general solution is presented and applied to the cathode and anode flow channels. Application to the anode requires modifications which is due to the occurrence of the water gas shift reaction on the channel hardware surfaces. DOE

N84-32734# Sandia Labs., Albuquerque, N. Mex.
REVIEW OF FLOW BATTERY TESTING AT SANDIA
P. C. Butler, D. W. Miller, C. E. Robinson, and G. P. Rodriguez 1984 13 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-011186; SAND-84-0982C; CONF-840804-6) Avail: NTIS HC A02/MF A01

Sandia National Laboratories is evaluating prototype zinc/bromine, Redox, and zinc/ferricyanide flowing electrolyte batteries and cells. Previous reports of test results of two Exxon zinc/bromine batteries and one NASA Redox iron/chromium battery are updated. Two 60-sq cm zinc/ferricyanide cells from Lockheed Missiles and Space Co., are also evaluated. Performance, life, and operating data will be described for these batteries and cells. DOE

N84-32735# Sandia Labs., Albuquerque, N. Mex.
A 50 kJ REPETITIVELY PULSED CAPACITOR BANK
G. J. Robwein 1984 10 p refs Presented at the 16th Power Modulator Symp., Arlington, Va., 17 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012959; SAND-84-0269C; CONF-8406137-1) Avail: NTIS HC A02/MF A01

A 50 kJ capacitor bank designed for continuous rep-rated operation was built and tested. The bank is a low inductance dual polarity arrangement with 26 parallel spark gap switches. The multiple switches and isolated capacitor pairs contribute to long life and high operational reliability, which were two primary design goals. DOE

N84-32736# Battelle Columbus Labs., Ohio. Electro-chemical Technology Group.

ANALYSIS OF LEAD-ACID BATTERY DEEP-CYCLE ACCELERATED TESTING DATA
John E. Clifford and Ralph E. Thomas Jun. 1984 65 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013192; SAND-84-7105) Avail: NTIS HC A04/MF A01

Battelle conducted a detailed analysis of the deep cycle, accelerated test data (at a nominal 70 C) obtained by Exide in the three-year, Phase 1 program to develop advanced lead-acid batteries for utility load leveling. Cycle life results for 60 lead-acid cells in three fractional factorial experiments were analyzed to develop quantitative relationships for real-time cycles to failure as a function of cell design variables. Important factors affecting cycle life were depth of discharge with respect to plate active material and acid within the plate stack, acid specific gravity, separator system design, and additives in the active material. DOE

N84-32737# Department of Energy, Washington, D. C.
METHOD AND APPARATUS FOR MAKING SUPERCONDUCTIVE MAGNET COILS Patent Application
Albert R. Borden, inventor (to DOE) Filed 7 Nov. 1983 18 p
(Contract DE-AC03-76SF-00098)
(DE84-014510; US-Patent-Appl-SN-549379) Avail: NTIS HC A02/MF A01

A curved, shell type magnet coil, adapted to be used in a superconducting magnet, is wound by providing a mandrel having a tubular cylindrical midportion terminating at both ends in tapered end portions formed with longitudinal slots having flexible fingers therebetween. An elongated electrical conductor is wound around an elongated oval shaped pole island engaged with the outside of the cylindrical midportion, to form a multiplicity of oval shaped turns engaged with a 180 degree segment of the mandrel. The coil turns have longitudinal portions with curved portions therebetween, engaging the tapered end portions of the mandrel. Upon completion of the winding, tapered expansion members are fully inserted into the tapered end portions, to displace the flexible fingers outwardly into a cylindrical form and to displace the curved portions of the turns into a shape conforming to such cylindrical form while also exerting increased tension upon the turns to minimize draping of the turns and to enhance the mechanical integrity of the coil. A half cylinder clamp may then be employed to clamp the coil, whereupon the coil may be solidified by the use of an epoxy adhesive. DOE

N84-32738# Department of Energy, Washington, D. C.
HIGH POWER MICROWAVE GENERATOR Patent Application
Carl A. Ekdahl, inventor (to DOE) Filed 29 Dec. 1983 28 p
(Contract W-7405-eng-36)
(DE84-014230; US-Patent-Appl-SN-566761) Avail: NTIS HC A03/MF A01

A microwave generator efficiently converts the energy of an intense relativistic electron beam (REB) into a high power microwave emission using the Smith-Purcell effect which is related to Cerenkov radiation. Feedback for efficient beam bunching and high gain is obtained by placing a cylindrical Smith-Purcell transmission grating on the axis of a toroidal resonator. High efficiency results from the use of a thin cold annular highly-magnetized REB that is closely coupled to the resonant structure. DOE

N84-32739# Department of Energy, Washington, D. C.
ELECTRODE-ACTIVE MATERIAL FOR ELECTROCHEMICAL BATTERIES AND METHOD OF PREPARATION Patent Application
Ravi Varma, inventor (to DOE) Filed 7 Nov. 1983 12 p
(Contract W-31-109-eng-38)
(DE84-014508; US-Patent-Appl-SN-549382) Avail: NTIS HC A02/MF A01

A battery electrode material comprises a nonstoichiometric electrode active material which forms a redox pair with the battery electrolyte, an electrically conductive polymer present in the range of from about 2% by weight to about 5% by weight of the electrode active material, and a binder. The conductive polymer provides improved proton or ion conductivity and is a ligand resulting in metal ion or negative ion vacancies of less than about 0.1 atom percent. Specific electrodes of nickel and lead are disclosed. DOE

N84-32740# Department of Energy, Washington, D. C.
MAGNETIC FLUORESCENT LAMP Patent Application
Samuel M. Berman and Robert W. Richardson, inventors (to DOE) Filed 29 Dec. 1983 18 p
(Contract DE-AC03-76SF-00098)
(DE84-014231; US-Patent-Appl-SN-566849) Avail: NTIS HC A02/MF A01

The radiant emission of a mercury argon discharge in a fluorescent lamp assembly is enhanced by providing means for establishing a magnetic field with lines of force along the path of electron flow through the bulb of the lamp assembly, to provide zeeman splitting of the ultraviolet spectral line. Optimum results are obtained when the magnetic field strength causes a zeeman splitting of approximately 1.7 times the thermal line width. DOE

N84-32741# Argonne National Lab., Ill.
ELECTROCHEMICAL PERFORMANCE OF POROUS NICKEL SULFIDE ELECTRODES
L. Redey and D. R. Vissers 1984 4 p refs Presented at Internatl. Soc. of Electrochem., Berkeley, Calif., 5 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-009586; CONF-840853-2) Avail: NTIS HC A02/MF A01

A characterization of the electrochemical performance utilization and voltage loss of porous nickel sulfide electrodes in molten salt electrolytes is presented. DOE

N84-32742# Michigan Univ., Ann Arbor. Transportation Research Inst.
COMPARISON OF CRT (CATHODE RAY TUBE) ANTIREFLECTION FILTERS Final Report
D. E. Miller, E. A. Peterson, and P. Green May 1984 38 p
(PB84-202753; UMTRI-84-8) Avail: NTIS HC A03/MF A01 CSCL 09A

Two experiments examining the effects of various CRT screen treatments on reflectance and user performance are described. In the first experiment, physical measurements were taken of the light emitted and reflected from the screen of a popular video terminal. Measurements were taken for both normal and reverse polarity when the tube face was bare. Similarly, measurements were taken when the screen was covered with either a micromesh or plastic filter. Measurements were taken at the center and upper-right corner of the screen. At the center point there were no significant differences in reflectance due to polarity, but differences due to screen filters were significant. The second experiment was a human performance test concerning the same six treatment conditions and terminal as were used in the first experiment. Six university students were asked to count how often the character-pair 3-W occurred within a block of text shown on the screen. GRA

N84-32587# Joint Publications Research Service, Arlington, Va.
OPTIMUM SYNTHESIS OF STEPPED SECOND CLASS PHASE-SHIFTERS Abstract Only
V. P. Meshchanov, I. V. Metelnikova, and L. G. Fokeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 5 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2341-2346 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32591# Joint Publications Research Service, Arlington, Va.
ADAPTIVE ANALOG-TO-DIGITAL CONVERTER
Ye. L. Kon, N. N. Matushkin, and A. A. Yuzhakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 8-12 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 27, no. 1, 1984 p 52-56 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32592# Joint Publications Research Service, Arlington, Va.
LIGHT-EMITTING DIODE MATRIX FLAT SCREEN Abstract Only
N. P. Ionov, B. V. Kazakov, V. V. Leonov, and M. N. Platonov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 17 Transl. into ENGLISH from Tekhn. Kino i Televideniya (Moscow), no. 11, Nov. 1983 p 47-48 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32593# Joint Publications Research Service, Arlington, Va.
ESTIMATION OF SENSITIVITY THRESHOLD IN INTEGRATING ANALOG-TO-DIGITAL CONVERTERS WITH AVERAGING OF READINGS Abstract Only
A. I. Fedonin and A. B. Andreyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 19 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 48-50 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32594# Joint Publications Research Service, Arlington, Va.
INDUCTIVE TRANSDUCER FOR DISPLACEMENT-TO-FREQUENCY CONVERSION Abstract Only
V. K. Shakurskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 20 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 66-69 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32598# Joint Publications Research Service, Arlington, Va.
INTERRELATION BETWEEN PARAMETERS OF M-TYPE TRAVELING WAVE TUBE Abstract Only
V. F. Ivoylov and A. S. Chernyshev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 38 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 1986-1992 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32599# Joint Publications Research Service, Arlington, Va.
FREQUENCY CONVERSION IN PHOTOMULTIPLIER DURING INTERACTION OF PHOTOELECTRON BEAM AND ELECTRIC FIELD IN HETERODYNE Abstract Only
V. A. Dianova, Ye. R. Mustel, V. N. Parygin, and V. I. Bezruchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 39 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 2047-2051 Original language document previously announced in IAA as A84-12596 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32603# Joint Publications Research Service, Arlington, Va.
UTILIZATION OF NONLINEAR PROPERTIES OF IMPATT-DIODES IN MICROWAVE DEVICES (SURVEY) Abstract Only
S. M. Dyachenko, S. A. Zinchenko, B. A. Kotserzhinskiy, and V. P. Taranenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 43 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radiotekhn. (Kiev), v. 26, no. 10, Oct. 1983 p 4-18 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32604# Joint Publications Research Service, Arlington, Va.
SUPERCONDUCTIVE FILMS IN MICROWAVE MICROELECTRONICS (SURVEY) Abstract Only
O. G. Vendik and A. B. Kozyrev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 44 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 18-28 Original language document previously announced in IAA as A84-14914 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32606# Joint Publications Research Service, Arlington, Va.
DESIGN OF LOCKED MICROWAVE OSCILLATORS ON BASIS OF SCATTERING PARAMETERS OF TRANSISTORS OPERATING IN LARGE SIGNAL MODE Abstract Only
G. V. Petrov and A. V. Khramov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 46-47 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 51-55 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32609# Joint Publications Research Service, Arlington, Va.
CORRELATIONAL ESTIMATION OF PARAMETERS OF SOLID STATE MICROWAVE DEVICES Abstract Only
I. V. Lebedev, A. S. Shnitnikov, and Yu. S. Solodov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 47 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 55-59 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32610# Joint Publications Research Service, Arlington, Va.
MODULATION OF MICROWAVE POWER WITH ELECTRON TRANSFER DIODES Abstract Only
V. F. Kolomoytsev, V. Ya. Krys, and I. I. Sokolovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 48-49 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 75-77 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32623*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A HIGH-PERFORMANCE HYBRID RF ISOLATION AMPLIFIER
G. L. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 1-8 (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09A

N84-32625*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH POWER K SUB a -BAND TRANSMITTER FOR PLANETARY RADAR AND SPACECRAFT UPLINK
A. M. Bhanji, D. J. Hoppe, R. W. Hartop, E. W. Stone (Varian Associates, Inc.), W. A. Imbriale (Varian Associates, Inc.), D. Stone, and M. Caplan *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 24-48 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09A

N84-33361# Massachusetts Inst. of Tech., Cambridge.
CUSTOM INTEGRATED CIRCUITS
Jonathan Allen, L. A. Glasser, Paul Penfield, Jr., Ronald Rivest, Gerald J. Sussman, J. L. Wyatt, Howard Shrobe, Jr., R. Armstrong, C. Bamji, C. Hauck et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 173-179 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-32743 Delaware Univ., Newark.
NUMERICAL TECHNIQUES FOR THE PREDICTION OF FLOW INDUCED ORIENTATION Ph.D. Thesis
Richard Clay Givler 1983 334 p
Avail: Univ. Microfilms Order No. DA8412713

Short fiber orientations are predicted from the mold processing conditions based on the dilute suspension theory. The velocity

components and the stream function are, in general, solved by the finite element method. Fiber orientations within the flow are subsequently calculated in terms of the fluid kinematics. Three distinct numerical schemes are developed for the prediction of short fiber orientations; one method endeavors to track individual fiber motions within the flow to determine a particle trajectory. Secondly, random initial fiber orientation conditions imposed at the inlet sections of the mold are simulated by a statistical orientation distribution. A third technique utilizes the Galerkin finite element method which is applied directly to the system of orientation equations to obtain a piecewise continuous approximation to the fiber orientation state on a grid of triangular and/or quadrilateral quadratic elements. Dissert. Abstr.

N84-32744 Delaware Univ., Newark.
NATURAL CONVECTION IN POROUS MEDIA: AN EXPERIMENTAL AND NUMERICAL STUDY FOR VERTICAL ANNULAR AND RECTANGULAR ENCLOSURES Ph.D. Thesis
Vishwanath Prasad 1983 403 p
Avail: Univ. Microfilms Order No. DA8412697

Natural convection in vertical annular and rectangular enclosures filled with with saturated porous media is studied numerically and experimentally for Rayleigh numbers up to 10,000. For numerical investigation, both isothermal and uniform heat flux boundary conditions are considered for the cavity whereas in the case of annulus the inner wall is assumed to be isothermally heated. In each case, velocity and temperature fields are analyzed through the streamline and isotherm patterns. The agreement between the experimental values of Nusselt number based on the effective conductivity and the analytical or numerical results is excellent. It is concluded that a unique relationship exists between the Nusselt and Rayleigh numbers unless Darcy's law is inapplicable. The factors which influence the limiting Rayleigh numbers (for breakdown of the formulation based on Darcy's law) are also discussed. Dissert. Abstr.

N84-32745 Michigan Univ., Ann Arbor.
THERMALLY INDUCED INSTABILITIES OF TWO-LAYER FLUID SYSTEMS Ph.D. Thesis
Marc Stuart Ingber 1984 120 p
Avail: Univ. Microfilms Order No. DA8412165

Thermally induced instabilities of two layer fluid systems are studied by the use of both a linear and nonlinear analysis. Two essentially different destabilizing mechanisms are identified, namely buoyancy and surface tension. A general procedure is developed to determine the relative importance of each mechanism. The interfacial boundary conditions are comparisons with experiment are performed to attain a level of confidence. The investigation is motivated from the study of the geophysical problem of a body of water cooled by the atmosphere. The effects of surface tension and surface curvature are explored in depth. The reinforcing nature of the destabilizing mechanisms, surface tension and buoyancy is demonstrated. The relationship between the mean surface tension and surface curvature is also investigated. Dissert. Abstr.

N84-32746 Pittsburgh Univ., Pa.
A FINITE ELEMENT IMPLEMENTATION OF THE DUAL VARIABLE METHOD FOR THE NAVIER-STOKES EQUATIONS Ph.D. Thesis
Frank Rodney Sledge 1983 247 p
Avail: Univ. Microfilms Order No. DA8411630

The numerical solution of two-dimensional, transient, incompressible Navier-Stokes problems on rather arbitrary bounded regions is considered. A finite element implementation of the method is presented, using quadrilateral piecewise bilinear velocity/constant pressure elements. The primary tool employed is combinatoric graph theory. A class of finite element decompositions is described, and the pertinent properties of such decompositions are discussed. Decompositions consisting of rectangular or square elements are considered as a special sub-class, as are decompositions of flow regions which are not simply connected. Algorithms for the determination of a basis for N(A) and a particular solution are presented and discussed with examples. Dissert. Abstr.

N84-32747 British Library Lending Div., Boston Spa (England).
SPECIAL FEATURES OF THE FORMATION OF A BED OF POLYDISPERSED FREE-FLOWING MATERIALS
M. Yu. Pazyuk, V. I. Grankovskii, and G. V. Turovtsev 19 Jun. 1984 7 p refs Transl. into ENGLISH from Izv. (USSR) p 13-16 (BLL-M-35674-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

Two relations are derived that characterize the distribution of particles of a free-flowing material over the height of a bed being formed, in particular of sintering mix on the strand. The relations are analyzed and the mathematical models are compared with real systems comprising a roller feeder and charging chute or a vibrating feeder and charging chute. It is concluded that the formation process of the bed is influenced mainly by its physico-mechanical properties and the slope of the charging chute. Author

N84-32748*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MULTI-LEG HEAT PIPE EVAPORATOR Patent Application
Joseph P. Alario, inventor (to NASA) (Grumman Aerospace Corp., Bethpage, N.Y.) Filed 31 May 1984 12 p
(NASA-Case-MSC-20812-1; NAS 1.71:MSC-20812-1; US-Patent-Appl-SN-616002) Avail: NTIS HC A02/MF A01 CSCL 20D

A multileg heat pipe evaporator facilitates the use and application of a monogroove heat pipe by providing an evaporation section which is compact in area and structurally more compatible with certain heat exchangers or heat input apparatus. The evaporation section of a monogroove heat pipe is formed by a series of parallel legs having a liquid and a vapor channel and a communicating capillary slot therebetween. The liquid and vapor channels and interconnecting capillary slots of the evaporating section are connected to the condensing section of the heat pipe by a manifold connecting liquid and vapor channels of the parallel evaporation section legs with the corresponding liquid and vapor channels of the condensing section. NASA

N84-32749*# Bjorksten Research Labs., Inc., Madison, Wis.
DEVELOPMENT OF THE SONIC PUMP LEVITATION Interim Summary Report
Stanley A. Dunn (Sedun, Inc., Madison, Wisc.) Aug. 1984 95 p (Contract NAS8-33513)
(NASA-CR-161963; NAS 1.26:161963) Avail: NTIS HC A05/MF A01 CSCL 20D

A prototype levitating/positioning device termed the Sonic Pump Levitator was designed, built and successfully tested in full gravity and in the reduced gravity of the parabolic flight regime of the KC-135. Positioning is achieved by timely and appropriate application of gas momentum from one or more of six sonic pumps. The sonic pumps, which are arranged orthogonally in opposed pairs about the levitation region, are activated by an electro-optical, computer controlled, feedback system. The sonic pump is a transducer which is capable of converting sound energy into a directed flow of gas. It consists of a loudspeaker whose face is sealed by a closure perforated by one or more orifices. The diaphragm of the loudspeaker is the only moving part of the sonic pump, no valves being needed. This very low inertia electromechanical device was developed to provide the short response time necessary to keep pace with the demands of computerized position keeping. B.W.

N84-32750*# Little (Arthur D.), Inc., Cambridge, Mass.
THE DEVELOPMENT OF A HIGH-CAPACITY INSTRUMENT MODULE HEAT TRANSPORT SYSTEM, APPENDIXES Final Report
30 Sep. 1981 107 p refs
(Contract NAS5-26350)
(NASA-CR-175260; NAS 1.26:175260) Avail: NTIS HC A06/MF A01 CSCL 20D

Data sheets provide temperature requirements for 82 individ-

ual instruments that are under development or planned for grouping on a space platform or pallet. The scientific objectives of these instrument packages are related to solar physics, space plasma physics, astronomy, high energy astrophysics, resources observations, environmental observations, materials processing, and life sciences. System specifications are given for a high capacity instrument module heat transport system to be used with future payloads. A.R.H.

N84-32751*# Rensselaer Polytechnic Inst., Troy, N. Y.
MASS TRANSFER FROM A CIRCULAR CYLINDER: EFFECTS OF FLOW UNSTEADINESS AND SLIGHT NONUNIFORMITIES Final Report
M. L. Marziale and R. E. Mayle Sep. 1984 244 p refs
(Grant NaG-3262)
(NASA-CR-174759; NAS 1.26:174759) Avail: NTIS HC A11/MF A01 CSCL 20D

Experiments were performed to determine the effect of periodic variations in the angle of the flow incident to a turbine blade on its leading edge heat load. To model this situation, measurements were made on a circular cylinder oscillating rotationally in a uniform steady flow. A naphthalene mass transfer technique was developed and used in the experiments and heat transfer rates are inferred from the results. The investigation consisted of two parts. In the first, a stationary cylinder was used and the transfer rate was measured for Re = 75,000 to 110,000 and turbulence levels from .34 percent to 4.9 percent. Comparisons with both theory and the results of others demonstrate that the accuracy and repeatability of the developed mass transfer technique is about + or - 2 percent, a large improvement over similar methods. In the second part identical flow conditions were used but the cylinder was oscillated. A Strouhal number range from .0071 to .1406 was covered. Comparisons of the unsteady and steady results indicate that the magnitude of the effect of oscillation is small and dependent on the incident turbulence conditions. Author

N84-32752*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SUPERFLUID HELIUM 2 LIQUID-VAPOR PHASE SEPARATION: TECHNOLOGY ASSESSMENT
Jeffrey M. Lee Jul. 1984 43 p refs
(NASA-TM-85966; A-9768; NAS 1.15:85966) Avail: NTIS HC A03/MF A01 CSCL 20L

A literature survey of helium 2 liquid vapor phase separation is presented. Currently, two types of He 2 phase separators are being investigated: porous, sintered metal plugs and the active phase separator. The permeability K(P) shows consistency in porous plug geometric characterization. Both the heat and mass fluxes increase with K(P). Downstream pressure regulation to adjust for varying heat loads and both temperatures is possible. For large dynamic heat loads, the active phase separator shows a maximum heat rejection rate of up to 2 W and bath temperature stability of 0.1 mK. Porous plug phase separation performance should be investigated for application to SIRTF and, in particular, that plugs of from 10 to the minus ninth square centimeters to 10 to the minus eighth square centimeters in conjunction with downstream pressure regulation be studied. M.A.C.

N84-32753*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE STRUCTURE OF THE VORTICITY FIELD IN TURBULENT CHANNEL FLOW. PART 1: ANALYSIS OF INSTANTANEOUS FIELDS AND STATISTICAL CORRELATIONS
Parviz Moin and John Kim Aug. 1984 41 p refs
(NASA-TM-86019; A-9848; NAS 1.15:86019) Avail: NTIS HC A03/MF A01 CSCL 20D

An investigation into the existence of hairpin vortices in turbulent channel flow is conducted using a database generated by the large eddy simulation technique. It is shown that away from the wall the distribution of the inclination angle of vorticity vector attains its maximum at about 45 deg to the wall. Two point correlations of velocity and vorticity fluctuations strongly support a flow model consisting of vortical structures inclined at 45 deg to the wall. The instantaneous vorticity vectors plotted in planes inclined at 45 deg show that the flow contains an appreciable number of hairpins. Vortex lines are used to display the three dimensional structure of hairpins, which are shown to be generated from deformation of transverse vortex filaments. Author

N84-32754# Puerto Rico Univ., Mayaguez.
TWO PHASE SYSTEM; INTERFACIAL TURBULENCE
W. Khan Jun. 1984 16 p
(Grant DAAG29-82-G-0005)
(AD-A143182; ARO-19201.2-EG-H) Avail: NTIS HC A02/MF A01 CSCL 20/4

A study of interfacial turbulence is necessary to elucidate the complex nature of transport properties across turbulent interfaces occurring in engineering problems, where the structure of the turbulence in the bulk phase is germane to interfacial conditions - hence transport properties - and facilitates a theoretical assessment of the problem. The structure in a single phase system which has already been assessed, can be considered as a special case of a two phase dynamic system where one phase is at rest. There are obvious similarities in the turbulence structure of both systems, but unlike previous authors who envisage isolated pieces of turbulence (eddies) as migrating into the interface from the bulk phase - which is not compatible with the concept of turbulence phenomena - Khan was able to provide a more plausible and realistic explanation of interfacial turbulence, and hence surface renewal. The author has formulated a theoretical assessment of the problem based on this model of turbulence structure. GRA

N84-32755# California Univ., Berkeley. Dept. of Mechanical Engineering.
DEVELOPING TURBULENT FLOW IN STRONGLY CURVED PASSAGES OF SQUARE AND CIRCULAR CROSS-SECTION Final Report, 1 Nov. 1979 - 31 Oct. 1983
J. A. C. Humphrey and B. E. Launder Mar. 1984 75 p
(Contract N00014-80-C-0031)
(AD-A143279) Avail: NTIS HC A04/MF A01 CSCL 20/4

A summary is provided of the achievements and recommendations related to this research program. Reference is made to the extensive documentation already published. The appendix to this report contains recent experimental results obtained in a 180 deg curved pipe of circular cross-section. The results differ significantly from corresponding measurements in curved ducts. Author (GRA)

N84-32756# Pennsylvania State Univ., University Park. Applied Research Lab.
THE EFFECTS OF POROUS MATERIAL ON MICROBUBBLE SKIN FRICTION REDUCTION
N. K. Madavan, S. Deutsch, and C. L. Merkle 9 Dec. 1983 30 p
(Contract N00014-81-C-0481)
(AD-A143401; ARL/PSU/TM-83-202) Avail: NTIS HC A03/MF A01 CSCL 20/4

Previous results have shown that the injection of a high concentration of microbubbles into a turbulent boundary layer can produce sizeable skin friction reductions. The present paper investigates the role of the porous material in this phenomenon. A variety of different porous surfaces have been tested: a series of sintered metal plates with widely different pore sizes; a specially constructed porous material, composed of plastic strips; and two different porous section lengths. The effects of gravity were determined by changing the orientation of the porous surface with respect to the boundary layer. A notable conclusion is that the skin friction reduction is not critically related to the characteristics of the porous material. GRA

N84-32757# Tel-Aviv Univ. (Israel). School of Engineering.
MANIPULATION OF THE MIXING PROCESS BETWEEN STREAMS OF DIFFERENT VELOCITY AND TEMPERATURE IN THE PRESENCE OF PRESSURE GRADIENT Annual Report, Oct. 1982 - Sep. 1983
S. Einav Sep. 1983 56 p
(Contract DAJA37-80-C-0645)
(AD-A143467) Avail: NTIS HC A04/MF A01 CSCL 12/1

The aim of this phase of the project was to create a tool for linking the flow-pictures of the disturbed two-dimensional mixing-layer and the phase-locked averaged data calculated form experimentally measured velocity signals. We could thus relate the quantitative analysis of our experimental data to the visually observed phenomena. Of particular interest is the presence of a pairing process of vortices in the experimental data. There are two theoretical approaches to deal with the mixing-layer type of flow. One is based upon stability theory, and the other tries to solve the basic flow equations by various mathematical models. This report compares both the longitudinal and lateral velocity components, as well as the vorticity distribution, using the multiple-scales expansion method. Simultaneous measurements of two velocity components formed the experimental basis for this comparison. GRA

N84-32758# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
ON THE FINITE ELEMENT APPROXIMATION OF THE STREAM FUNCTION-VORTICITY EQUATIONS
M. D. Gunzburger and J. S. Peterson (Pittsburgh Univ.) 1984 11 p Presented at the 5th IMACS Intern. Symp. on Computer Methods for Partial Differential Equations, 1984
(Contract DAAG29-83-K-0084; Grants AF-AFOSR-0101-83; AF-AFOSR-0176-80)
(AD-A143506; AFOSR-84-0564TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Finite element algorithms are presented for the approximate solution of the stream function-vorticity equations of steady incompressible viscous flows. Both the linear Stokes and the nonlinear Navier-Stokes equations are considered. The methods discussed require low continuity finite element spaces and do not require any artificial specification of the vorticity at solid boundaries. Particular attention is paid to methods for multiply connected domains and to theoretical and computational estimates for the accuracy of the algorithms. Brief consideration is also given to three dimensional problems, to exterior problems, and to the recovery of the pressure field. Author (GRA)

N84-32759# Pittsburgh Univ., Pa. Inst. for Computational Mathematics and Applications.
COMPUTATIONAL FLUID DYNAMICS AT THE ICMA (INSTITUTE OF COMPUTATIONAL MATHEMATICS AND APPLICATIONS) Final Scientific Report, 1 Jun. 1980 - 31 May 1984
C. Hall and T. Porsching Jun. 1984 22 p
(Grant AF-AFOSR-0176-80)
(AD-A143510; AFOSR-84-0569TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

This research concerned three independent projects of ICMA (Institute of Computational Mathematics and Applications) personnel, each belonging to the general area of computational fluid dynamics. The first project dealt with the computation of stationary Navier-Stokes solutions using continuation methods. Error estimates for certain finite element solutions of continuation problems were derived and extensions to more general operators including the Navier-Stokes operator were investigated. Numerical methods for the detection of Hopf bifurcation were studied. The second project involved construction, analysis and implementation of efficient computer algorithms for the finite difference and finite element-dual variable discretization of the two-dimensional Navier-Stokes problems. Particular attention was given to finite element and finite differences discretization such problems that arise in combustor modeling. The third project sought to extend the dual variable reduction technique to various fluid models. This required the construction of a network analogue for the discrete difference equations along with an analysis of the fundamental matrix and dual variable transformation involved. Author (GRA)

N84-32760# Naval Postgraduate School, Monterey, Calif.
REPRESENTATION OF POTENTIAL FLOW ABOUT AXISYMMETRIC BODIES WITH DISCRETE SINGULARITIES M.S. Thesis
L. C. Janikowsky Mar. 1984 161 p
(AD-A143526) Avail: NTIS HC A08/MF A01 CSCL 20/4

A rational methodology has been developed whereby three-dimensional sources and sinks may be placed along the major axis of a class of ovary ellipsoids so as to minimize normal velocity and to calculate as exactly as possible the tangential velocity, pressure distribution, and the body shape. For this purpose the strength and position of the singularities and the position and number of the control points were optimized through the use of the method of least squares and the Automated Design Synthesis optimization technique. The results have shown that the previous methods are far from satisfactory and the use of two types of optimization in the determination of the strength and position of the singularities yields and the desired body shape and flow characteristics with excellent accuracy. A comprehensive computer code has been developed to enable one to calculate most of the practically significant body shapes. Author (GRA)

N84-32761# Reeves (C. Richard), Austin, Tex.
HIGH EFFICIENCY HEAT PUMP USING GROUND HEAT SOURCE Final Report
C. Richard Reeves Dec. 1983 26 p refs
(Contract DE-FG46-80R6-12054)
(DE84-006385; DOE/R6-12054/T1) Avail: NTIS HC A03/MF A01

The purpose of this project was to demonstrate a high efficiency ground coupled heat pump for residential use. The most important aspect of the demonstration was the method of ground coupling for the heat pump. The system used a water well and closed loop heat exchanger for ground coupling in a method that is practical and may be widely applied in the central Texas area. The heat pump system was installed in a typical family residence in Austin, Texas, and used as the only means of heating and cooling for one year. System performance was monitored and operating data were recorded and compared with predictions made during the design phase of this project. A summary of the project and a list of conclusions concerning the performance and practicality of the heat pump system demonstrated are presented. The design of the system and predictions made for its performance are discussed. The measured performance of the demonstration system is discussed. A cost comparison of the demonstration system and a more conventional heat pump system is included. Cost figures for the demonstration system are presented. DOE

N84-32762# Institute of Gas Technology, Chicago, Ill.
EFFECTS OF SYSTEM AND GEOMETRICAL PARAMETERS ON THE FLOW OF CLASS-B SOLIDS IN OVERFLOW STANDPIPES
R. A. Sauer, I. H. Chan, and T. M. Knowlton 1983 43 p refs Presented at Am. Inst. of Chem. Engr. Fall Ann. Meeting, Washington, D.C., 30 Oct. 1983
(Contract DE-AC21-80ET-14705)
(DE84-013948; CONF-831063-14) Avail: NTIS HC A03/MF A01

The flow characteristics of Class B solids through standpipes is investigated. Experiments conducted to determine the effects of solids flow rate, particle density, particle size, standpipe diameter, fluidizing gas velocity, standpipe pressure drop and standpipe exit height on the performance of standpipes operating in the overflow mode. The effects of the amount and location of standpipe aeration and the effect of standpipe angle of inclination are also examined. DOE

N84-32763# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
DEVELOPMENT OF ADVANCED THERMAL INSULATION FOR APPLIANCES
D. L. McElroy, D. W. Yarbrough, G. L. Copeland, F. J. Weaver, R. S. Graves, T. W. Tong (Kentucky Univ., Lexington), and H. A. Fine (Kentucky Univ., Lexington) Jul. 1984 71 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013132; ORNL/CON-159) Avail: NTIS HC A04/MF A01

The development of thermal insulation with an apparent thermal conductivity of less than 0.0072 W/(m K) is discussed. A theoretical model that includes radiative and conductive heat transfer shows that the target thermal resistance can be attained by combinations of very fine powders and reduced pressures. Thermal conductivities

of fine powders were measured with three apparatuses. A linear heat flow measurement demonstrated apparent thermal conductivities as low as 0.0087 W/(m K) for evaluated panels containing fine particles. Radial heat flow measurements on fine powders as a function of temperature, gas pressure, and bed density show that apparent thermal conductivities below the target value can be achieved with pressures below 100 Pa. The radial heat flow measurements demonstrated the existence of an optimum mass fraction solid in the powder insulations. DOE

N84-32764# Brookhaven National Lab., Upton, N. Y. Applied Mathematics Dept.

A TWO-FLUID INSTABILITY

H. Bruce Stewart 1984 8 p refs Presented at the 22nd Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5 Aug. 1984

(Contract DE-AC02-76CH-00016)

(DE84-012899; BNL-34707; CONF-840816-13) Avail: NTIS HC A02/MF A01

The ability of interpenetrating flow models to represent multidimensional instabilities is probed by numerical experiments with an L-shaped two-fluid jet. Periodic and nonperiodic oscillations of various types are observed, and a partial phase portrait is constructed. The numerical experiments suggest new approaches to verifying transient interpenetrating flow models. DOE

N84-32765# Oak Ridge Gaseous Diffusion Plant, Tenn.

EKMAN BOUNDARY CONDITIONS FOR NUMERICAL MODELS OF CENTRIFUGE FLOWS

J. E. Park and J. B. Drake Apr. 1984 30 p refs

(Contract DE-AC05-84OR-21400)

(DE84-013576; K/CSD/TM-52) Avail: NTIS HC A03/MF A01

The boundary layers which form on the ends of a gas centrifuge have received a great deal of analytical attention in predicting flows within gas centrifuges. Three basic approaches were taken in estimating the heat transfer and drag at the solid gas interfaces at the ends of a centrifuge. First, the details of the flow may be estimated numerically using finite difference techniques and a very fine grid in the vicinity of the ends. The cost in computer time and memory charges is great and the extensive detail is difficult to utilize effectively. Second, the boundary layers may simply be ignored. With this approach, the size of the finite difference mesh is controlled by other considerations which allow economically attractive simulation of centrifuge flows for many situations. The third effort is to model the boundary layers analytically and couple those models to solutions for the interior flow. Previous efforts to model the the boundary layers are reviewed. DOE

N84-32766# Argonne National Lab., Ill.

SLOSHING RESPONSE OF A REACTOR TANK WITH INTERNALS

D. C. Ma, J. Gvildys, and Y. W. Chang 1984 4 p refs Presented at 5th Am. Soc. of Civil Engr./Engr. Mech. Specialty Conf., Laramie, Wyo., 1 Aug. 1984

(Contract W-31-109-eng-38)

(DE84-009629; CONF-840833-4) Avail: NTIS HC A02/MF A01

The sloshing response of a large reactor tank with in tank components is presented. It is indicated that the presence of the internal components can significantly change the dynamic characteristics of the sloshing motion. The sloshing frequency of a tank with internals is considerably higher than that of a tank without internal. The higher sloshing frequency reduces the sloshing wave height on the free surface but increases the dynamic pressure in the fluid. DOE

N84-32767# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mechanical Engineering.

DEVELOPING TURBULENT FLOW IN A 180(0) CURVED PIPE AND ITS DOWNSTREAM TANGENT

J. Azzola and J. A. C. Humphrey May 1984 59 p refs Presented at the 2d Intern. Symp. on Appl. of Laser Anemometry to Fluid Mech., Lisbon, 2-4 Jul. 1984

(Contracts DE-AC03-76SF-00098; N00014-80-C-0031)

(DE84-013391; LBL-17681; CONF-840753-1) Avail: NTIS HC A04/MF A01

Laser Doppler measurements of the longitudinal and circumferential velocity components are reported for developing turbulent flow in a strongly curved 180 degree pipe and its downstream tangent. In the bend, the mean longitudinal velocity component changes little after theta = 90 degrees but the circumferential component never achieves a fully developed state. Similar behavior is observed in the normal stresses, with large levels of flow anisotropy arising everywhere in the bend and downstream tangent. Between theta = 90 degrees and X/D = 5, the circumferential velocity profiles display reversals of the secondary flow which are essentially independent of the Reynolds number. Ostensible differences between turbulent flows through pipes of circular and square cross sections are revealed by comparing present results with the measurements of Chang, et al. Although limited in extent, the data should serve to guide and test theoretical developments for modeling developing turbulent flows in curved pipes. DOE

N84-32768# California Univ., Livermore. Lawrence Livermore Lab.

SIMULATION OF THE KELVIN-HELMHOLTZ INSTABILITY OF A SUPERSONIC SLIP SURFACE WITH THE PIECEWISE-PARABOLIC METHOD (PPM)

Paul R. Woodward 19 Mar. 1984 18 p refs Presented at the INRIA Workshop on Numerical Methods for the Euler Equations, Versailles, France, Dec. 1983 Submitted for publication

(Contract W-7405-eng-48)

(DE84-013219; UCRL-90662; CONF-831284-1) Avail: NTIS HC A02/MF A01

The Piecewise-Parabolic Method (PPM) was used to study the nonlinear development of the Kelvin-Helmholtz instability of a Mach 2 slip surface in both a gamma law gas and in an isothermal gas. A simplified version of PPM appropriate to this and other problems with only weak shocks is described. The instability calculations demonstrate the usefulness of discontinuity steepening in PPM and illustrate the complexity in a flow problem which this method treats accurately on Cray-I-class computers. The simulations also bring to light characteristic combinations of nonlinear waves which arise from finite amplitude perturbations of the slip surface and which exhibit an approximately self similar growth. After passing through a fairly chaotic phase of development, the mixing layer generated by the instability achieves a relatively ordered state which does not appear to depend greatly upon the nature of the initial perturbation, but which does depend upon the length scale over which strict periodicity is enforced in the simulation. DOE

N84-32769# Los Alamos Scientific Lab., N. Mex.

HIGH-EFFICIENCY PARTICULATE AIR FILTER BEHAVIOR AT HIGH-SPEED FLOWS

P. K. Tang, W. S. Gregory, C. I. Ricketts, and P. R. Smith Apr. 1984 13 p refs

(Contract W-7405-eng-36)

(DE84-014137; LA-10078-MS) Avail: NTIS HC A02/MF A01

This paper presents a filter model based on the principle of fluid flow through porous media. The model includes both laminar and turbulent effects. The coefficients used in the model are determined empirically based on existing data. Deviation from the model is discussed. DOE

N84-32770# Sandia Labs., Albuquerque, N. Mex.

LEAST-SQUARES SMOOTHING OF DIRECT-EXCHANGE IN ZONAL ANALYSIS

M. E. Larsen and J. R. Howell (Texas Univ., Austin) 1984 17 p refs Presented at 22nd Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5 Aug. 1984

(Contract DE-AC04-76DP-00789)

(DE84-002612; SAND-83-2358C; CONF-840816-1) Avail: NTIS HC A02/MF A01

The method of Lagrange-multipliers has been used to determine adjustments to be made to a set of direct-exchange areas used in zonal analysis of a radiating enclosure containing a participating medium. The resulting adjusted direct-exchange areas satisfy

conservation laws and the condition that an objective function be minimized. The objective function allows weights to be assigned to each adjustment. The solution of a set of linear algebraic equations yields the required adjustments. The method is well-suited for adjusting a set of direct-exchange areas which are assumed to include random inaccuracies. Other adjustment techniques in the literature are discussed and compared, and application of the present method is demonstrated. DOE

N84-32771# Argonne National Lab., Ill.
HEAT TRANSFER WITH PHASE CHANGE IN PLATE-FIN HEAT EXCHANGERS
C. B. Panchal 1984 15 p refs Presented at 22nd Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-006405; CONF-840816-4) Avail: NTIS HC A02/MF A01

A theoretical and experimental study was conducted for convective evaporation and condensation in plate-fin compact heat exchangers. The overall performance of a brazed-aluminum heat exchanger in the evaporation mode with ammonia and in the condensation mode with both ammonia and refrigerant R-22 as working fluids. The heat exchanger has straight perforated fins on the working-fluid side and extruded rectangular channels on the single-phase (water) side. The two-phase flow in narrow channels of the heat exchanger is modeled using a triangular relationship between pressure gradient, liquid film flow rate, and film thickness. The overall performance of the heat exchanger is calculated by employing local heat-transfer analysis and integrating mass- and heat-balance equations along the heat-exchanger length. Theoretical predictions are found to agree favorably with experimental results for a prototypical heat exchanger unit. DOE

N84-32772# Pacific Northwest Lab., Richland, Wash.
LARGE HAWT (HORIZONTAL-AXIS WIND TURBINE) WAKE MEASUREMENT AND ANALYSIS
A. H. Miller, H. L. Wegley, and J. W. Buck May 1984 9 p refs Presented at the NASA/DOE Wind Turbine Technol. Workshop, Cleveland, 8-10 May 1984
(Contract DE-AC06-76RL-01830)
(DE84-013269; PNL-SA-12245; CONF-8405153-2) Avail: NTIS HC A02/MF A01

From the theoretical fluid dynamics point of view, the wake region of a large horizontal-axis wind turbine was defined and described, and numerical models of wake behavior were developed. Wind tunnel studies of single turbine wakes and turbine array wakes were used to verify the theory and further refine the numerical models. The effects of scaling, rotor solidity, and topography on wake behavior are questions that remain unanswered. In the wind tunnel studies, turbines were represented by anything from scaled models to tea strainers or wire mesh disks whose solidity was equivalent to that of a typical wind turbine. The scale factor compensation for the difference in Reynolds number between the scale model and an actual turbine is complex, and not typically accounted for. Though it is wise to study the simpler case of wakes in flat topography, current indications are that wind turbine farm development is actually occurring in somewhat more complex terrain. DOE

N84-32773# Iowa Univ., Iowa City. Inst. of Hydraulic Research.
MEASUREMENT OF SKIN FRICTION IN UNSTEADY BOUNDARY LAYERS USING A FLUSH-MOUNTED HOT-FILM GAGE
A. N. Menendez and B. R. Ramaprian Apr. 1984 93 p refs
(Contract DAAG29-83-K-0004; Grant DAAG29-79-G-0017)
(PB84-197995; IIHR-272) Avail: NTIS HC A05/MF A01 CSCL 20D

Flush mounted hot film gages have proved very effective in measuring skin friction in steady laminar and turbulent boundary layer flows. Their use is based on the analogy between momentum and heat transfer in the boundary layer. An extension of this technique for use with unsteady flows is presented through the formulation of a more general relationship between the rates of heat and momentum transfer at the wall. The accuracy of the new formula and the range of its applicability are examined for the case of a periodic boundary layer, both in the laminar and turbulent regimes. This is accomplished by comparing the formula against exact numerical solution of the differential equations. The present extension allows one to apply the hot film technique to general unsteady flow situations, including the measurement of the spectral density of wall shear stress fluctuations in steady turbulent flows. Author (GRA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-32774 Department of the Navy, Washington, D. C.
PULSE DRIVER FOR FLUX GATE MAGNETOMETER Patent
R. E. Brown, inventor (to Navy) Issued 8 May 1984 6 p
(AD-D011053; US-Patent-4,447,776; US-Patent-Appl-SN-256868; US-Patent-Class-324-253) Avail: US Patent & Trademark Office CSCL 14/2

A driver circuit for a fluxgate magnetometer has a repetition rate controllable independent of the magnetometer core winding inductances, and a current-ON interval terminated only by core saturation. In this manner, power consumption is greatly reduced as compared to prior magnetometers without sacrificing low-noise operation. Previous drivers operated in a free-running flyback mode at high pulse repetition rates. The present driver reduces the oscillator repetition rate, and power consumption, by the use of a control loop from the flyback oscillator which signals the end of a current pulse as the magnetometer core rebounds from the saturated state. Author (GRA)

N84-32775 Department of the Navy, Washington, D. C.
VISUAL FIELD PERIMETER AND PSYCHOMOTOR TRACKING PERFORMANCE MEASURING APPARATUS Patent
M. M. Cohen, J. J. Palumbo, D. C. Johanson, and J. G. Nelson, inventors (to Navy) Issued 20 Dec. 1983 7 p Supersedes AD-D010248
(AD-D011056; US-Patent-4,421,393; US-Patent-Appl-SN-257683; US-Patent-Class-351-224) Avail: US Patent & Trademark Office CSCL 06/19

A system for evaluating tolerance to high acceleration as a function of visual field perimeter and psychomotor tracking ability is discussed. A semicircular array of light-emitting diodes (LED's) subtend the lateral field of view of a subject. Pairs of opposed LED's are sequentially illuminated inwardly or outwardly at a programmed rate. A control stick manipulated by the subject provides a nulling signal for maintaining a desired pair of LED's illuminated. GRA

N84-32776 Department of the Air Force, Washington, D.C.
THREE-WIRE STATIC STRAIN GAGE APPARATUS Patent
W. F. Bridges, inventor (to Air Force) Issued 15 May 1984 4 p Supersedes AD-D010040
(AD-D011130; US-Patent-4,448,078; US-Patent-Appl-SN-444006; US-Patent-Class-73-766) Avail: US Patent & Trademark Office CSCL 14/2

A three-wire static strain gage apparatus utilizing a switching unit in combination with a Wheatstone bridge circuit to make strain gage measurements which are temperature corrected by switching to a temperature gage to measure the strain gage circuit's temperature at the time of the strain measurement. GRA

N84-32777 Department of the Air Force, Washington, D.C.
TEMPERATURE CONTROLLED GYRO Patent
J. M. Kennel, inventor (to Air Force) Issued 15 May 1984 6 p Supersedes AD-D009639

(AD-D011138; US-Patent-4,448,086; US-Patent-Appl-SN-380451; US-Patent-Class-74-5R) Avail: US Patent & Trademark Office CSCL 17/7

This application describes a method of, and apparatus for, eliminating the error-causing heat convections of a liquid which is disposed between a warm cylindrical float that houses a navigational gyro and a cool cylindrical gyro case that houses the float. The method includes the performance of steps which result in raising the temperature of the gyro case to the temperature of the float. The apparatus includes a temperature controller assembly which further includes temperature sensitive resistors to ascertain the temperatures respectively, of the float and of the gyro case; a differential amplifier to ascertain the difference in the temperatures; and a heater coil surrounding the gyro case to heat the case to the higher temperature of the float. Author (GRA)

N84-32778 Department of the Air Force, Washington, D.C.
VARIABLE GAIN OVEN TEMPERATURE CONTROL CIRCUIT Patent
M. E. Frerking, inventor (to Air Force) Issued 15 May 1984 5 p Supersedes AD-D010116
(AD-D011141; US-Patent-4,449,032; US-Patent-Appl-SN-465228; US-Patent-Class-219-210) Avail: US Patent & Trademark Office CSCL 09/5

The frequency of an electronic oscillator is controlled by a crystal located in the oven. The heaters in the oven include resistance elements for quick warm-up, and steady state. The circuit allows the quick warm-up power to be reduced incrementally as the set temperature is approached and effects a smooth transition to the steady-state heater. This is accomplished by circuit features which reduce the control loop gain when high power is applied to the heaters and increase the gain as the warm-up power decreases. Author (GRA)

N84-32779 Department of the Air Force, Washington, D.C.
EYE SAFE LASER TRANSMITTER Patent
R. V. Wick, inventor (to Air Force) Issued 12 Jun. 1984 5 p Supersedes AD-D009338
(AD-D011145; US-Patent-4,453,806; US-Patent-Appl-SN-339261; US-Patent-Class-350-431) Avail: US Patent & Trademark Office CSCL 20/5

This abstract describes an apparatus for converting a high intensity spatially coherent laser beam into a source of spatially incoherent radiation that retains the temporal, amplitude and frequency characteristics, and also the polarization, of the spatially coherent laser beam. A laser is oriented so that its coherent output beam falls on a transmissive optical lens which images the coherent beam onto the surface of a ground glass plate that has been etched with hydrofluoric acid to form a spatial diffuser. The radiation that emerges from the diffuser has been converted into spatially incoherent radiation that retains some important characteristics of the coherent beam, namely polarization and temporal coherence. The diffuser outputs a diverging beam of substantially incoherent radiation to a collimator that provides a collimated output beam that can be used in laser communicators, laser rangefinders and other laser field devices in an eyesafe mode. GRA

N84-32780*# Honeywell, Inc., Minneapolis, Minn. Solid State Electronics Div.
RESEARCH PRESSURE INSTRUMENTATION FOR NASA SPACE SHUTTLE MAIN ENGINE, MODIFICATION NO. 6 Monthly Progress Report
P. J. Anderson and R. L. Johnson Mar. 1984 21 p
(Contract NAS8-34769)
(NASA-CR-171126; NAS 1.26:171126; MPR-6) Avail: NTIS HC A02/MF A01 CSCL 14B

Research concerning the utilization of silicon piezoresistive strain sensing technology for space shuttle main engine applications is reported. The following specific topics were addressed: (1) transducer design and materials, (2) silicon piezoresistor characterization at cryogenic temperatures, (3) chip mounting characterization, and (4) frequency response optimization. R.S.F.

N84-32781*# Honeywell, Inc., Minneapolis, Minn.
RESEARCH PRESSURE INSTRUMENTATION FOR NASA SPACE SHUTTLE MAIN ENGINE, MODIFICATION NO. 5 Monthly Progress Report
P. J. Anderson, P. Nussbaum, and G. Gustafson Apr. 1984 36 p
(Contract NAS8-34769)
(NASA-CR-171125; NAS 1.26:171125; MPR-7) Avail: NTIS HC A03/MF A01 CSCL 14B

The advantages of silicon piezoresistive strain sensing technology are being used to achieve the objectives of state of the art pressure sensors for SSME applications. The integration of multiple functions on a single chip is the key attribute being exploited. Progress is reported in transducer packaging and materials; silicon resistor characterization at cryogenic temperatures; chip mounting; and frequency response optimization. A.R.H.

N84-32782*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PIEZOELECTRIC DEICING DEVICE Patent Application
R. Finke and B. Banks, inventors (to NASA) Filed 7 Aug. 1984 9 p Continuation of US-Patent-Appl-SN-469867, filed 25 Feb. 1983
(NASA-Case-LEW-13773-2; NAS 1.71:LEW-13773-2; US-Patent-Appl-SN-638541) Avail: NTIS HC A02/MF A01 CSCL 14B

A fast voltage pulse is applied to a transducer which comprises a composite of multiple layers of alternately polarized piezoelectric material. These layers are bonded together and positioned over the curved leading edge of an aircraft wing structure. Each layer is relatively thin and metallized on both sides. The strain produced in the transducer causes the composite to push forward resulting in detachment and breakup of ice on the leading edge of the aircraft wing. NASA

N84-32783*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRUCTURAL DESIGN OF A VERTICAL ANTENNA BORESIGHT 18.3 BY 18.3-m PLANAR NEAR-FIELD ANTENNA MEASUREMENT SYSTEM
G. Richard Sharp, Paul A. Trimarchi, and Joyce S. Wanhainen 1984 26 p refs Proposed for presentation at the Meeting of the Antenna Measurement Techniques Association, San Diego, Calif., 2-4 Oct. 1984
(NASA-TM-83781; E-2274; NAS 1.15:83781) Avail: NTIS HC A03/MF A01 CSCL 14B

A large very precise near-field planar scanner was proposed for NASA Lewis Research Center. This scanner would permit near-field measurements over a horizontal scan plane measuring 18.3 m by 18.3 m. Large aperture antennas mounted with antenna boresight vertical could be tested up to 60 GHz. When such a large near field scanner is used for pattern testing, the antenna or antenna system under test does not have to be moved. Hence, such antennas and antenna systems can be positioned and supported to simulate configuration in zero g. Thus, very large and heavy machinery that would be needed to accurately move the antennas are avoided. A preliminary investigation was undertaken to address the mechanical design of such a challenging near-field antenna scanner. The configuration, structural design and results of a parametric NASTRAN structural optimization analysis are contained. Further, the resulting design was dynamically analyzed in order to provide resonant frequency information to the scanner mechanical drive system designers. If other large near field scanners of comparable dimensions are to be constructed, the information can be used for design optimization of these also. Author

N84-32784*# Information and Control Systems, Inc., Hampton, Va.
A SIMULATION OF REMOTE SENSOR SYSTEMS AND DATA PROCESSING ALGORITHMS FOR SPECTRAL FEATURE CLASSIFICATION Final Report
Robert F. Arduini, R. Martin Aherron, and Richard W. Samms

Jul. 1984 54 p refs
(Contract NAS1-16870)
(NASA-CR-172393; NAS 1.26:172393; FR-683110) Avail: NTIS HC A04/MF A01 CSCL 14B

A computational model of the deterministic and stochastic processes involved in multispectral remote sensing was designed to evaluate the performance of sensor systems and data processing algorithms for spectral feature classification. Accuracy in distinguishing between categories of surfaces or between specific types is developed as a means to compare sensor systems and data processing algorithms. The model allows studies to be made of the effects of variability of the atmosphere and of surface reflectance, as well as the effects of channel selection and sensor noise. Examples of these effects are shown. Author

N84-32785*# Texas A&M Univ., College Station. Remote Sensing Center.
DEVELOPMENT AND CHARACTERIZATION ANALYSIS OF A RADAR POLARIMETER Final Report
S. Bong and A. J. Blanchard Mar. 1983 164 p refs
(Contract NAS5-26686)
(NASA-CR-175259; NAS 1.26:175259) Avail: NTIS HC A08/MF A01 CSCL 14B

The interaction of electromagnetic waves with natural earth surface was of interest for many years. A particular area of interest in controlled remote sensing experiments is the phenomena of depolarization. The development stages of the radar system are documented. Also included are the laboratory procedures which provides some information about the specifications of the system. The radar system developed is termed the Radar Polarimeter System. A better insight of the operation of the RPS in terms of the newly developed technique–synthetic aperture radar system is provided. System performance in tems of radar cross section, in terms of powor, and in terms of signal to noise ratio are also provided. In summary, an overview of the RPS in terms of its operation and design as well as how it will perform in the field is provided. Author

N84-32786*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TECHNIQUE FOR MEASURING GAS CONVERSION FACTORS Patent Application
Jag J. Singh, inventors (to NASA) and Danny R. Sprinkle Filed 23 Jul. 1984 12 p
(NASA-Case-LAR-13220-1; NAS 1.71:LAR-13220-1;
US-Patent-Appl-SN-633179) Avail: NTIS HC A02/MF A01 CSCL 14B

A method for determining hydrocarbon conversion factors for a flowmeter is described. A mixture of air, O2 and C(x)H(y) is burned and the partial pressure of the O2 in the resulting gas is forced to equal the partial pressure of O2 in the air. The flow rate of the O2 flowing into the mixture is measured and the flow rate of C(x)H(y) flowing into the mixture is measured. These measured values are used to calculate the conversion factors F = O2 flow rate/(m/n)x reading on the dial of the flowmeter where m/n is calculated in the product gas for the hydrocarbon C(x)H(y) with the assumption that the mole fraction of oxygen in the product gas is the same as the air. Author

N84-32787*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VOLUMETRIC FUEL QUANTITY GAUGE Patent Application
H. Douglas Garner and William E. Howell, inventors (to NASA) Filed 23 Aug. 1984 11 p
(NASA-Case-LAR-13147-1; NAS 1.71:LAR-13147-1;
US-Patent-Appl-SN-643523) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus to determine the volume of fuel remaining in a reservoir regardless of the attitude, shape, or agitation of the fuel is described. The pressure in the reservoir is continuously cycled between two preselected pressure levels as determined by a pressure sensitive switch. The time required to effect the pressure change between the preselected levels is measured by a timer apparatus and is indicative of the volume of fuel remaining in the reservoir. NASA

N84-32788*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MESOSCALE OBSERVATIONS OF LIGHTNING FROM SPACE SHUTTLE
B. Vonnegut (State Univ. of N.Y., Albany), O. H. Vaughan, Jr., M. Brook (N. Mex. Inst. of Mining and Technology, Socorro), and P. Krehbiel (N. Mex. Inst. of Mining and Technology, Socorro) Sep. 1984 26 p refs
(NASA-TM-86451; NAS 1.15:86451) Avail: NTIS HC A03/MF A01 CSCL 04B

Motion pictures have been taken at night by astronauts on the space shuttle showing lightning discharge that spread horizontally at speeds of 100,000/msec for distances over 60 km. Tape recordings have been made of the accompanying optical pulses detected with a photocell optical system. The observations show that lightning is often a mesoscale phenomena that can convey large amounts of electric charge to Earth from an extensive cloud system via a cloud to ground discharge. Author

N84-32789*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARACTERISTICS AND CAPACITIES OF THE NASA LEWIS RESEARCH CENTER HIGH PRECISION 6.7- BY 6.7-m PLANAR NEAR-FIELD SCANNER
G. R. Sharp, R. J. Zakrajsek, R. R. Kunath, C. A. Raquet, and R. E. Alexovich 1984 27 p ref Presented at the Meeting of the Antenna Meas. Tech. Assoc., San Diego, Calif., 2-4 Oct. 1984
(NASA-TM-83785; E-2281; NAS 1.15:83785) Avail: NTIS HC A03/MF A01 CSCL 14B

A very precise 6.7- by 6.7-m planar near-field scanner has recently become operational at the NASA Lewis Research Center. The scanner acquires amplitude and phase data at discrete points over a vertical rectangular grid. During the design phase for this scanner, special emphasis was given to the dimensional stability of the structures and the ease of adjustment of the rails that determine the accuracy of the scan plane. A laser measurement system is used for rail alignment and probe positioning. This has resulted in very repeatable horizontal and vertical motion of the probe cart and hence precise positioning in the plane described by the probe tip. The resulting accuracy will support near-field measurements at 60 GHz without corrections. Subsystem design including laser, electronic and mechanical and their performance is described. Summary data are presented on the scan plane flatness and environmental temperature stability. Representative near-field data and calculated far-field test results are presented. Prospective scanner improvements to increase test capability are also discussed. Author

N84-32790*# Pratt and Whitney Aircraft, East Hartford, Conn. Engineering Div.
TURBINE BLADE AND VANE HEAT FLUX SENSOR DEVELOPMENT, PHASE 1 Final Report
W. H. Atkinson, M. A. Cyr, and R. R. Strange Aug. 1984 88 p refs
(Contract NAS3-23529)
(NASA-CR-168297; NAS 1.26:168297; PWA-5914-21) Avail: NTIS HC A05/MF A01 CSCL 14B

Heat flux sensors available for installation in the hot section airfoils of advanced aircraft gas turbine engines were developed. Two heat flux sensors were designed, fabricated, calibrated, and tested. Measurement techniques are compared in an atmospheric pressure combustor rig test. Sensors, embedded thermocouple and the Gordon gauge, were fabricated that met the geometric and fabricability requirements and could withstand the hot section environmental conditions. Calibration data indicate that these sensors yielded repeatable results and have the potential to meet the accuracy goal of measuring local heat flux to within 5%. Thermal cycle tests and thermal soak tests indicated that the sensors are capable of surviving extended periods of exposure to the environment conditions in the turbine. Problems in calibration

of the sensors caused by severe non-one dimensional heat flow were encountered. Modifications to the calibration techniques are needed to minimize this problem and proof testing of the sensors in an engine is needed to verify the designs. Author

N84-32791*# Pacific Northwest Lab., Richland, Wash.
DEVELOP REAL-TIME DOSIMETRY CONCEPTS AND INSTRUMENTATION FOR LONG-TERM MISSIONS Final Report
L. A. Braby, C. A. Ratcliffe, N. F. Metting, and M. K. Lien Jun. 1984 154 p refs Sponsored in part by NASA
(Contract DE-AC06-76RL-01830)
(NASA-CR-171809; NAS 1.26:171809; PNL-5112) Avail: NTIS HC A08/MF A01 CSCL 14B

The development of a small, self-contained system to measure dose and evaluate dose equivalent in real time in the complex radiation environment encountered in space is investigated. The device measures the distribution of energy deposits in microscopic tissue volumes and, from this distribution, calculates the dose and dose equivalent. Precise determinations can be made using an expression for quality factor in terms of energy deposition. Brief discussions of microdosimetry as it applies to health physics, an evaluation of different methods for calculating dose equivalent, descriptions of the hardware and software making up the prototype instrument, and the performance results when exposed to a variety of radiations are presented. M.A.C.

N84-32792# Naval Research Lab., Washington, D. C.
PASSIVE LINE-OF-SIGHT STABILIZATION FOR AN INFRARED SENSOR Final Report, Sep. 1982 - Aug. 1983
R. L. Lucke 28 Jun. 1984 15 p
(F12-152)
(AD-A143305; NRL-8828) Avail: NTIS HC A02/MF A01 CSCL 17/7

The use of passive gyroscopic stabilization in the vibrational environment of a P-3 aircraft is described theoretically. The conclusion is reached that even a fairly heavy instrument (30 kg) can have its line of sight stabilized to a precision of 100 microradians or better. Author (GRA)

N84-32793# Naval Biodynamics Lab., New Orleans, La.
PHOTODIGITIZING PROCEDURES
P. D. Kilgore and J. H. Gottbrath Feb. 1984 33 p
(M00-97-PN)
(AD-A143589; AD-E800972; NBDL-84R002) Avail: NTIS HC A03/MF A01 CSCL 14/5

This report documents procedures and programs for efficiently running the Photo Digitizing System at the Naval Biodynamics Laboratory. Procedures have been tested and have been found to be effective. Any future acquisitions of programs or changes to current programs should be incorporated in these procedures. On-going research programs use high speed instrumentation cameras to record the motion of test subjects during biodynamic experiments. The films are digitized and the 3-dimensional motion is reconstructed and analyzed. Experimental research is performed to determine the effects of aircraft crashes, ship motion, vibration, aircraft ejection and parachute opening forces on the health and performance of Navy personnel. Author (GRA)

N84-32794# Department of the Navy, Washington, D. C.
FIBER OPTIC MAGNETOMETER FOR THE DETECTION OF dc MAGNETIC FIELDS WITHOUT HYSTERETIC AMBIGUITY Patent Application
K. P. Koo and G. H. Siegel, inventors (to Navy) 15 May 1984 24 p
(AD-D011085; US-Patent-Appl-SN-610460) Avail: NTIS HC A02/MF A01 CSCL 14/2

This invention relates to magnetometers, and more particularly to magnetometers of the fiber optic type. Sensing of magnetic fields using fiber optic interferometers has been demonstrated recently. In these devices, a two-arm Mach-Zehnder fiber interferometer is used wherein one of the fiber optic interferometer arms serves as a sensor arm on which some magnetostrictive material is deposited. When exposed to a magnetic field, the magnetostrictive material will stretch the sensor fiber while the reference fiber remains unaffected. As a result, a magnetically induced differential path length change or phase shift is introduced at the output of the interferometer. GRA

N84-32795# Department of the Air Force, Washington, D.C.
PORTABLE VISUAL FUNCTION TESTER Patent Application
H. L. Task and L. V. Genco, inventors (to Air Force) Filed 11 Apr. 1984 27 p
(AD-D011105; US-Patent-Appl-SN-599088) Avail: NTIS HC A03/MF A01 CSCL 14/2

A novel portable visual function tester and reliable testing method is described for the rapid and accurate measurement of several parameters of human vision, including critical fusion frequency, stereopsis. The visual display patterns may comprise light emitting diodes: the electronics of the system may include an audio recorder for recording the selected vision parameter measurement and the observations using the system, and may be battery powered for portability. GRA

N84-32796# Sandia Labs., Albuquerque, N. Mex.
RECTANGULAR HEAT SOURCE ON A SEMI-INFINITE SOLID: AN ANALYSIS OF A THIN FILM HEAT FLUX GAGE
N. R. Keltner, J. V. Beck (Michigan State Univ.), and B. L. Bainbridge May 1984 22 p refs Presented at the 22nd Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012234; SAND-84-0248C; CONF-840816-12) Avail: NTIS HC A02/MF A01

A thin film flux gage was developed for a series of combustion experiments. The gage was designed to provide both rapid response and long use time. Initial calibrations using standard techniques indicated large differences between the literature and the estimated properties. In order to calibrate this gage without resorting the destructive property measurements, an analytical model of the gage response to a step heating current was developed. The model is in the form of three algebraic expressions which correspond to the early, middle, and late time regimes. The expressions are used to provide a framework for least squares estimates of the gage parameters. There is very good agreement between the model and the experimental data. The estimated parameter values demonstrate good to excellent repeatability and good agreement with both new literature data and results from destructive property measurements. DOE

N84-32797# Hawaii Univ., Manoa.
FIELD SURVEYS OF CARBON MONOXIDE IN COMMERCIAL SETTINGS USING PERSONAL EXPOSURE MONITORS Final Report
P. G. Flachsbart and W. R. Ott (Environmental Protection Agency, Washington, D.C.) Feb. 1984 164 p refs
(PB84-211291; EPA-600/4-84-019) Avail: NTIS HC A08/MF A01 CSCL 14B

Miniaturized personal exposure monitors (PEMs) were employed to measure carbon monoxide (CO) in 588 different commercial settings (e.g., retail stores, office buildings, hotels, restaurants) in five California cities. Altogether, 5000 CO observations were made by recording the instantaneous instrument reading at 1-minute intervals as the investigators walked along sidewalks and into buildings. For 11 of 15 survey dates, two investigators walked side-by-side, permitting two adjacent PEMs to be compared. Quality assurance tests for 1706 pairs of values showed a very high degree of agreement. CO levels for indoor commercial settings were similar to those measured outdoors on sidewalks, apparently because the pollutant seeps into the structures from traffic outside. Although indoor levels usually were above 0 ppm, they seldom were above 9 ppm (the National Ambient Air Quality Standard for an 8-hour exposure), unless some indoor source could be identified. Carbon monoxide levels on outdoor streets did not vary greatly on different sides of the street, on corners and faces of blocks, and intersections. GRA

N84-32798# Monsanto Research Corp., Dayton, Ohio.
PASSIVE SAMPLING DEVICE FOR AMBIENT AIR AND PERSONAL MONITORING
G. W. Wooten, J. E. Strobel, J. V. Pustinger, and C. R. McMillin Jun. 1984 72 p refs
(Grant EPA-68-02-3469)
(PB84-210046; EPA-600/4-84/050) Avail: NTIS HC A04/MF A01 CSCL 14B

A high performance passive dosimeter has been developed and evaluated as a monitor for volatile organics in ambient air and for short-term, low-level personal monitoring applications. The dosimeter design was dictated by three major areas of concern: (1) diffusive mass transport considerations; (2) sorbent selection, and (3) chemical quantitation of the collected compounds, which intimately involves desorption procedures of the passive device. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-32799 Department of the Air Force, Washington, D.C.
LOW HEAT LOSS LASER COMBUSTION CHAMBER Patent
S. Huniu and W. C. Bailey, inventors (to Air Force) Issued 12 Jun. 1984 7 p Supersedes AD-D010048
(AD-D011107; US-Patent-4,453,914; US-Patent-Appl-SN-449921; US-Patent-Class-431-121) Avail: US Patent & Trademark Office CSCL 21/2

A low heat loss combustion chamber for a gain generator assembly is shown. The gain generator assembly operates in a cylindrical gas laser. The combustion chamber includes a plurality of primary rings having fuel and oxidizer injectors therein as well as primary nozzles. End caps attached to the primary rings contain reaction products so that they flow through the primary nozzles on the primary rings past a secondary injector array into a lasing cavity of the gas laser. Author (GRA)

N84-32800 Department of the Navy, Washington, D. C.
INTERFEROMETRICALLY TUNED LASER RESONATOR Patent
L. C. Bobb, M. Rankin, and G. D. Ferguson, inventors (to Navy) 20 Mar. 1984 5 p Supersedes AD-D009452
(AD-D011125; US-Patent-4,438,517; US-Patent-Appl-SN-210902; US-Patent-Class-372-99) Avail: US Patent & Trademark Office CSCL 09/1

Document describes an interferometrically tuned laser resonator for selectively resonating at a desired wavelength or fluorescent line. A dielectric reflector having reflectance characteristics which shift toward shorter wavelengths at incident angles not normal thereto is rotatable mounted at one end of a laser cavity along its axis. Rotation of the reflector permits adjustment of the incidence angle to obtain maximum cavity gain at a desired fluorescent line over adjacent competing lines. Author (GRA)

N84-32801# California Univ., Livermore. Lawrence Livermore Lab.
STRATEGIES OF DESIGN, DEVELOPMENT AND ACTIVATION OF THE NOVA CONTROL SYSTEM
Frederick W. Holloway 30 Jun. 1983 7 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-013075; UCRL-89552; CONF-831203-163) Avail: NTIS HC A02/MF A01

Nova and Novette are large complex experimental laser facilities which require extensive and sophisticated control systems for their successful operation. The design and performance of the Nova/Novette laser control system is presented. Special emphasis is given to certain invisible aspects such as overall strategy, management, resources, and historical constraints. It is concluded that these aspects often have a more profound effect upon success of operation than any specific hardware/software design. E.R.

N84-32802*# Laser Analytics, Inc., Bedford, Mass.
DEVELOPMENT OF LONG WAVELENGTH SEMICONDUCTOR DIODE LASERS NEAR 28 MICRONS FOR USE IN INFRARED HETERODYNE SPECTROMETERS Final Report
Kurt J. Linden Jun. 1984 60 p refs
(Contract NAS5-26200)
(NASA-CR-175253; NAS 1.26:175253) Avail: NTIS HC A04/MF A01 CSCL 20E

The development of tunable diode lasers operating in the 28 micrometers spectral region for use in infrared heterodyne spectrometers is reported. A process capable of yielding lasers emitting 500 micron W of multimode power, 112 micron W in a true single mode and true single mode operation at laser currents of up to 35% above threshold was developed. Results were obtained from narrow mesastripe (20 micrometer wide) short cavity (120 micrometer length) laser configurations. Six stripe geometry lasers, with a variety of cavity widths and lengths were delivered. The techniques to fabricate such devices was obtained and the long term reliability of such lasers by reproducible electrical and optical output characteristics fabrication from lasers are demonstrated. E.A.K.

N84-32803# Materials Research Labs., Melbourne (Australia).
PULSED HYDROGEN-FLUORIDE LASER
R. McLeary May 1984 15 p refs
(MRL-R-831; AR-003-914) Avail: NTIS HC A02/MF A01

A pulsed hydrogen fluoride laser which was constructed at MRL is described. The laser delivers an energy of 7 J in a 1-microsec pulse from vibrational rotational transitions in the wavelength region 2.6 to 3.1 microns. It simultaneously produces 1 mJ of energy in a 1 microsec pulse from pure rotational transitions in the wavelength region 10 to 17 microns. Author

N84-32804# Royal Aircraft Establishment, Farnborough (England).
PRACTICAL PROBLEMS WITH CO2 LASER RADAR TESTS
K. Gullberg and A. Widen Sep. 1983 20 p refs Transl. into "ENGLISH of Erfarenheter Fran Foersoek Med CO2-Laserradar" rept. C-30221-E1 National Defence Research Inst., Stockholm, Sep. 1981
(RAE-Trans-2113; BR92720; C-30221-E1) Avail: NTIS HC A02/MF A01

Practical optical problems connected with beam paths and components which occur during a CO2 laser radar operation are described. Heterodyne detection with acousto-optical modulation and the Doppler laser radar are discussed. The laser radar and studies of target signatures with a coherent laser radar are presented. E.A.K.

N84-32805*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LASER FURNACE TECHNOLOGY FOR ZONE REFINING Final Report
Donald B. Griner Aug. 1984 31 p refs
(NASA-TM-86459; NAS 1.15:86459) Avail: NTIS HC A03/MF A01 CSCL 20E

A carbon dioxide laser experiment facility is constructed to investigate the problems in using a laser beam to zone refine semiconductor and metal crystals. The hardware includes a computer to control scan mirrors and stepper motors to provide a variety of melt zone patterns. The equipment and its operating procedures are described. M.A.C.

N84-32806# Royal Signals and Radar Establishment, Malvern (England).
A COMPACT FREQUENCY-STABLE PULSED CO-2 LASER
D. L. Jordon and R. C. Hollins 1984 15 p
(AD-A143216; RSRE-MEMO-3670; DRIC-BR-92075) Avail: NTIS HC A02/MF A01 CSCL 20/5

The aim of this memorandum is to outline the results of work carried out at RSRE to develop a compact frequency-stable CO2

laser. This work has resulted in the production of a simple, highly compact device (165 x 80 x 50 mm) having a 1.5 MW, 35 ns output pulse which is both inter and intra-pulse frequency-stable to within 3 MHz. Author (GRA)

N84-32807# Illinois Univ., Urbana. Dept. of Electrical Engineering.
VISIBLE AND NEAR-INFRARED DISSOCIATION LASERS Final Report, 21 Jan. 1982 - 20 Apr. 1984
J. G. Eden Jul. 1984 18 p
(Contract N00014-82-K-0209)
(AD-A143295; UILU-ENG-84-2548) Avail: NTIS HC A02/MF A01 CSCL 20/5

Experiments have been conducted in which a tunable, injection-locked cadmium monoiodide (CdI) laser has been demonstrated. Over a 50 A spectral region centered at 657 nm, complete locking of the slave amplifier occurs for injected laser intensities of 5 W - cm-2. Also, an electron beam pumped I2 green excimer amplifier at 506 nm has been developed. Coupling between the UV and green bands of I2 has been shown to be strong and the small signal gain coefficient at 506 nm is > 5% - cm-1. Author (GRA)

N84-32808# Deacon Research, Palo Alto, Calif.
MEASUREMENT OF THE TRANSVERSE MODE EXCITATION IN THE STIMULATED EMISSION OF THE ACO FREE ELECTRON LASER Final Report, 15 Sep. - 31 Dec. 1983
D. A. G. Deacon 30 Mar. 1984 61 p
(Contract F49620-83-C-0149; ARPA Order 3923; AF Proj. 3923)
(AD-A143449; DR-3; AFOSR-84-0573TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

Measurements of the off-diagonal terms in the transverse gain matrix of the free electron laser were obtained and analyzed under this contract. Quantitative agreement was demonstrated with the low-diffraction theory. The scaling was demonstrated as a function of analysis distance, electron beam size, and resonance parameter. The effects of multiple mode input were observed, and a general analytic expression derived for this regime. Author (GRA)

N84-32809# Stanford Univ., Calif. Physics Lab.
LASER PHYSICS AND LASER TECHNIQUES Final Technical Report, 1 Feb. 1982 - 31 Jan. 1984
A. E. Siegman Apr. 1984 43 p
(Contract F49620-82-K-0015)
(AD-A143538; GL-3712; AFOSR-84-0572TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report summarizes research, journal publications, and conference presentations in the areas of picosecond optical pulses and picosecond spectroscopy; laser-induced surface transformations and spontaneous ripples; tunable-laser-induced-grating spectroscopy; and optical phase conjugation and phase-conjugate resonators. GRA

N84-32810# Department of the Air Force, Washington, D.C.
TRANSVERSE FLOW CW ATOMIC IODINE LASER SYSTEM Patent Application
L. A. Schlie, inventor (to Air Force) Filed 27 Mar. 1984 21 p
(AD-D011098; US-Patent-Appl-SN-593759) Avail: NTIS HC A02/MF A01 CSCL 20/5

A transverse flow CW atomic iodine laser system uses a closed cycle fuel system to operate in a continuous mode. An elliptical pump cell having a Hg arc lamp cooled by deionized water irradiates with UV energy C3F7I gas to produce excited atomic iodine. A transverse flow section attached to the pump cell channels C3F7I gas into a laser cell where lasing occurs. The flow section has upstream and downstream flow cavities, triangular shaped, that channel the laser gas. A diffuser and flow straighteners are placed in these cavities to make the flow velocity across the transverse laser axis as uniform as possible so as to produce very stable laser gain output. Author (GRA)

N84-32811# Department of the Air Force, Washington, D.C.
LASER BEAM DUCT PRESSURE CONTROLLER SYSTEM Patent Application
A. J. Laderman, inventor (to Air Force) 6 Oct. 1983 13 p
(AD-D011102; US-Patent-Appl-SN-539352) Avail: NTIS HC A02/MF A01 CSCL 20/4

Document describes a laser beam duct pressure controller system for maintaining a spatially uniform pressure in a flowing gas volume which is subjected to temporal pressure variations. This desired result is accomplished, with cooperating structural components (and gases therein) which eliminate the axial flow of a conditioning gas within the laser beam duct, by matching the time rate of change of the pressure of the flowing conditioning gas to the time rate of change of the pressure in the cavity of an operably associated laser beam turret. Author (GRA)

N84-32812# Department of the Air Force, Washington, D.C.
BEAM RECOMBINATION VIA CYLINDRICAL MIRROR Patent Application
R. C. Hedin, inventor (to Air Force) Filed 25 Apr. 1984 12 p
(AD-D011104; US-Patent-Appl-SN-603795) Avail: NTIS HC A02/MF A01 CSCL 20/5

This invention relates generally to means of forming laser beams, and, more particularly, relates to a means for combining divergent conjugate laser beams. A beam recombiner is used to parallelize two first order beams emanating from an magneto-optic stripe domain light deflector. One arrangement uses a concave cylindrical mirror with a negative meniscus lens attached thereon to redirect a conjugate beam. The other arrangement uses a concave cylindrical mirror with a cylindrical rod placed at the radius of curvature of the mirror to redirect the conjugate beam. GRA

N84-32813# Department of the Air Force, Washington, D.C.
CW HF R-BRANCH LASER Patent Application
H. Injeyan, inventor (to Air Force) Filed 23 Feb. 1984 12 p
(AD-D011120; US-Patent-Appl-SN-583026) Avail: NTIS HC A02/MF A01 CSCL 20/5

The present invention relates generally to continuous wave (CW) chemical lasers, and, in particular, to a CW laser that outputs a wavelength in one of the atmospheric propagation windows. A continuous wave HF R-branch chemical laser uses a linear array nozzle system having primary and secondary nozzles for exciting HF and a laser resonator having mirrors with reflectance to discriminate against P-branch lasing of the excited HF. GRA

N84-32814# Westinghouse Research and Development Center, Pittsburgh, Pa.
WIDE SPECTRUM ANTIREFLECTIVE COATING FOR LASER FUSION SYSTEMS Final Report
B. E. Yoldas, D. P. Partlow, H. D. Smith, and D. M. Mattox 13 Jan. 1984 65 p refs
(Contract W-7405-eng-48)
(DE84-013211; UCRL-15600) Avail: NTIS HC A04/MF A01

A method to deposit a laser damage resistant, wide spectrum antireflective coating on fused silica was developed. The coating is applied from a specific silanol polymer solution and converted to a porous SiO2 film. The pore size of the film is reduced by a heat treatment to prevent UV scattering; gradation of the pore volume is achieved by a mild etching to a sufficient depth to prevent a smoother index transition from air to the substrate glass. The resulting antireflectivity covers the entire transmission range of silica and may be extended to a wavelength as short as 250 nm. Laser damage thresholds as high as 9 j/cm(2) are demonstrated on processed samples. DOE

N84-32815# California Univ., Livermore. Lawrence Livermore Lab. Special Studies Program.
WAFER-SCALE LASER PANTOGRAPHY. PART 6: DIRECT-WRITE INTERCONNECTION OF VLSI GATE ARRAYS
Bruce M. McWilliams, Hon Wah Chin, Irving P. Herman, Roderick A. Hyde, Fred Mitlitsky, John C. Whitehead, and Lowell L. Wood 25 Jan. 1984 14 p refs Presented at the SPIE Tech. Symp. and Instrument Exhibit, Los Angeles, 22-27 Jan. 1984
(Contract W-7405-eng-48)
(DE84-012676; UCRL-90295; CONF-840139-6) Avail: NTIS

HC A02/MF A01

General principles of laser direct write deposition processes are reviewed. Device interconnection of CMOS gate arrays by means of computer controlled, laser induced thermochemical surface reactions is described. Interconnection quality parameters are related, and processing rate considerations are discussed. DOE

N84-32816# California Univ., Livermore. Lawrence Livermore Lab.
DYNAMIC TESTING OF NOVA LASER STRUCTURAL SYSTEMS. THE NORTH SIDE OF SPACEFRAME TOWER
John W. Pastrnak and H. Joseph Weaver 22 Jun. 1984 48 p refs
(Contract W-7405-eng-48)
(DE84-014830; UCID-20116) Avail: NTIS HC A03/MF A01

NOVA is the latest in a series of powerful laser systems designed to study the feasibility of initiating a controlled fusion reaction by concentrating laser beams on a small fuel target, commonly called Inertial Confinement Fusion or ICF. The NOVA experimental facility is designed to produce 300 Kj of energy in order to demonstrate the ignition of thermonuclear burn. The laser components are all mounted on large welded steel frame structures. These structures are first analyzed with linear finite element models to access their seismic integrity as well as their overall vibrational stability. A modal analysis is performed on the North side spaceframe tower to verify the spacial mode shapes of the tower and their corresponding eigenvalues (resonant frequencies) as well as the global damping associated with each mode. A discussion of the experimental modal analysis procedure used for testing, the results from the modal analysis, and a comparison with earlier finite element results is presented. DOE

N84-32817# Los Alamos Scientific Lab., N. Mex.
BREAKDOWN PROCESSES IN LARGE-AREA COLD-CATHODE VACUUM TRIODES
R. B. Gibson 1984 5 p refs Presented at the 11th Intern. Symp. on Discharges and Elec. Insulation in Vacuum, Berlin, East Germany, 24-28 Sep. 1984
(Contract W-7405-eng-36)
(DE84-014026; LA-UR-84-2037; CONF-840981-3) Avail: NTIS HC A02/MF A01

Preionization of large aperture high pressure discharge pumped gas lasers which requires uniform 250 to 500 keV 10 to 100 mA cm(-2) electron beams of typically 1 to 10 x 10(3) cm(2) in the area were examined. Impedance collapse due to cathode plasma expansion renders diode electron guns and is inefficient in this application. The introduction of a control grid limits gun current to low, controllable values until plasma closure of the cathode grid gap occurs. Field enhancement at the grid can cause cathode grid or grid anode arcs which result in current runaway. Impedance collapse was studied by measuring element I-V characteristics in a 20 x 200 cm cold cathode triode electron gun. Impedance collapse of closure of the cathode grid gap and (2) grid anode arcs. Plasma closure rate was -2 x 10(6) cm sec(-1) independent of configuration or interelectrode potential. It is found that arc thresholds depend exclusively on local electric field strength at the grid which is a function of grid bias and grid geometry. Streamers and arcs are occasionally observed in the cathode grid region. DOE

N84-32818# Los Alamos Scientific Lab., N. Mex.
EVALUATION OF BIDIRECTIONALLY CONDUCTING THYRATRONS FOR PULSED EXCIMER LASERS
Glen McDuff, Kenneth Rust, Hugh Menown (English Electric Valve Co. Ltd., Chelmsford, England), and Chris Neale (English Electric Valve Co. Ltd., Chelmsford, England) 1984 5 p refs Presented at the 16th Power Modulator Symp., Arlington, Va., 18-20 Jun. 1984
(Contract W-7405-eng-36)
(DE84-013890; LA-UR-84-1773; CONF-8406137-13) Avail: NTIS HC A02/MF A01

New applications for excimer lasers in industry and defense programs are discussed. Many of the these programs have very stringent requirements of lifetime, reliability, and power that are not available commercially. Power conditioning systems capable of driving excimers with reliable lifetimes of 5 billion pulses were built with off the shelf components. The requirements and life test performance of three types of thyratrons designed specifically for driving excimer lasers and also the life of associated components are discussed. DOE

N84-32819# Department of Energy, Washington, D. C.
LASER UTILIZING A GASEOUS LASING MEDIUM AND METHOD FOR OPERATING THE SAME Patent Application
Bruce A. Zerr, inventor (to DOE) Filed 18 Oct. 1983 13 p
(Contract DE-AC05-84OR-21400)
(DE84-014500; US-Patent-Appl-SN-542968) Avail: NTIS HC A02/MF A01

The invention is an improved method for operating a high power gas laser. The improvement comprises introducing the gas lasing medium tangentially to the laser tube at a pressure establishing a forced vortex in the tube. The vortex defines an axially extending core region characterized by a low pressure and temperature relative to the gas inlet and the exterior of the vortex. An electrical discharge is established in the core region to initiate lasing of the gas. The gas discharge from the tube is passed through a diffuser. Firing results in a very abrupt increase in gas temperature and in severe disruption of the gas. The gas vortex almost immediately restores the gas to its prefiring condition. That is, almost all of the waste heat is transferred radially to the laser wall, and the original gas flow pattern is restored. As a result, the power output of the laser is increased significantly, and the laser firing repetition rate is markedly increased. DOE

N84-32566# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
A STUDY ON ACCURATE FREQUENCY-CONTROL OF SEMICONDUCTOR LASERS
Yukio Ohtaguro, Hideaki Sone, Hiroshi Echigo, and Tasuku Takagi *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 53, No. 1, Jul. 1984 Jul. 1984 p 11-14 refs In JAPANESE; ENGLISH summary (For primary document see N84-32565 22-31)
Avail: NTIS HC A03/MF A01

N84-32640*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STUDY OF DSN TRAVELING WAVE MASER SYSTEM RELIABILITY
R. Stevens and C. P. Wiggins *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 192-198 ref (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20E

N84-33143# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM USES UNIQUE FLEXIBLE WORKSHOP WITH LASER CUTTER
Michel Defaux *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-030) 7 Sep. 1984 p 22-24 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 5 Jul. 1984 p 43-44 (For primary document see N84-33141 22-70)
Avail: NTIS HC A04/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-32820 Michigan Univ., Ann Arbor.
THE CHEMICAL AND PHYSICAL CHANGES ON LUBRICATED SURFACES Ph.D. Thesis
Suck Choon Kang 1984 136 p
Avail: Univ. Microfilms Order No. DA8412172

The manufacturing of gears, cams, engine cylinder walls and other systems with lubricated surfaces are often well done to specifications and with great concern for cost. One subsequent

and expensive operation required of some surfaces, however, is breaking in. This is done as a separate operation before product delivery, or as part of a performance limit in operation in the early use of the product. To date, the choice of surface processes (carburizing, ion implantation, burnishing, etc.), the surface quality required in grinding, the best break in lubricant, and many other variables were empirically determined. But there was no complete explanation of what occurs during break in such that a low cost final finish is developed. Evidence gathered suggests that proper breaking in requires the formation of Pe3O4 on the sliding surface. Dissert. Abstr.

N84-32821 Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
NEW MACHINES FOR GRINDING, FACETTING AND PROFILING HARD MATERIALS
A. Wahlen 1983 11 p Transl. into ENGLISH from Ind. Diamanten Rundschau (West Germany), v. 15, no. 4, Oct.-Nov. 1981 p 250-253
(CSIR-Trans-1750) Avail: NTIS HC A02

The machines described are a grinding machine, model W-014, especially designed for grinding hard materials, such as glass, sapphire, ceramic or silicon parts clamped in packs, with diamond wheels, and a copy grinding machine, model W-018, for facetting or grooving components made of these materials. Author

N84-32822 British Library Lending Div., Boston Spa (England).
CERTAIN ASSUMPTIONS OF THEORY OF HYDRODYNAMIC LUBRICATION DURING METAL PRESSURE WORKING
G. L. Kolmogorov 19 Jun. 1984 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 10, 1983 p 66-71
(BLL-M-35661-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The hydrodynamic problem of delivery of the lubricant into the deformation zone is formulated and simplified. The need to take account of inertial forces in equations of flow of viscous fluid is examined. The effect of slip of the lubricant over the solid surfaces is analyzed. The compressibility of lubricating materials must be taken into account during pressure working of metals and alloys possessing high mechanical properties with hydrodynamic lubrication. Author

N84-32823*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LINEAR MOTION VALVE Patent Application
Joseph A. Chandler, inventor (to NASA) Filed 31 Jul. 1984 10 p
(NASA-Case-MSC-20148-1; NAS 1.71:MSC-20148-1; US-Patent-Appl-SN-636465) Avail: NTIS HC A02/MF A01 CSCL 13K

A linear motion valve is provided. The valve spool employs magnetically permeable rings, spaced apart axially, which engage a sealing assembly having magnetically permeable pole pieces in magnetic relationship with a magnet. The gap between the ring and the pole pieces is sealed with a ferrofluid. Depletion of the ferrofluid is minimized. NASA

N84-32824*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL ANALYSIS OF A PLANETARY TRANSMISSION WITH SPHERICAL ROLLER BEARINGS OPERATING AFTER COMPLETE LOSS OF OIL
Harold H. Coe Sep. 1984 14 p refs
(NASA-TP-2367; E-2008; NAS 1.60:2367) Avail: NTIS HC A02/MF A01 CSCL 13I

Planetsys and Spherbean, two computer programs developed for the analysis of rolling element bearings, were used to simulate the thermal performance of an OH-58 helicopter main rotor transmission. A steady state and a transient thermal analysis were made and temperatures thus calculated were compared with experimental data obtained from a transmission that was operated to destruction, which occurred about 30 min after all the oil was drained from the transmission. Temperatures predicted by Spherbean were within 3% of the corresponding measured values at 15 min elapsed time and within 9% at 25 min. Spherbean also indicates a potential for high bearing cage temperatures with misalignment and outer ring rotation. E.A.K.

N84-32825*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARACTERIZATION OF EROSION OF METALLIC MATERIALS UNDER CAVITATION ATTACK IN A MINERAL OIL
Bezzam C. S. Rao (Indian Inst. of Science, Bangalore, India) and Donald H. Buckley Sep. 1984 14 p refs
(NASA-TP-2368; E-2049; NAS 1.60:2368) Avail: NTIS HC A02/MF A01 CSCL 11F

Cavitation erosion and erosion rates of eight metallic materials representing three crystal structures were studied using a 20-kHz ultrasonic magnetostrictive oscillator in viscous mineral oil. The erosion rates of the metals with an fcc matrix were 10 to 100 times higher than that of an hcp-matrix titanium alloy. The erosion rates of iron and molybdenum, with bcc matrices, were higher than that of the titanium alloy but lower than those of the fcc metals. Scanning electron microscopy indicates that the cavitation pits are initially formed at the grain boundaries and precipitates and that the pits that formed at the triple points grew faster than the others. Transcrystalline craters formed by cavitation attack over the surface of grains and roughened the surfaces by multiple slip and twinning. Surface roughness measurements show that the pits that formed over the grain boundaries deepended faster than other pits. Computer analysis revealed that a geometric expression describes the nondimensional erosion curves during the time period $0.5\ t(0) < t < 2.5\ t(0)$, where t(0) is the incubation period. The fcc metals had very short incubation periods; the titanium alloy had the longest incubation period. A.R.H.

N84-32826# Committee on Small Business (U. S. House).
IMPACT OF ROBOTS AND COMPUTERS ON THE WORK FORCE OF THE 1980'S
Washington GPO 1984 258 p refs Hearings before the Subcomm. on Gen. Oversight of the Comm. on Small Business, 98th Congr., 1st Sess., 17-18 May 1983
(GPO-31-912) Avail: Subcommittee on General Oversight

The economic and technological impact of robotics and artificial intelligence on the work force is examined through the testimony of government, industry, and university representatives. A current assessment of the skills of the labor force, educational opportunities, and projected unemployment figures are also discussed. M.A.C.

N84-32827*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRCRAFT LANDING DYNAMICS FACILITY CARRIAGE WELD TEST PROGRAM
Ashby G. Lawson Sep. 1984 70 p ref
(NASA-TM-85802; NAS 1.15:85802) Avail: NTIS HC A04/MF A01 CSCL 13I

A welded tubular structure constructed of low alloy high strength quenched and tempered steel was tested. The consistency of the mechanical strengths and chemical composition and the degree of difficulty of obtaining full strength welds with these steels is characterized. The results of constructing and testing two typical connections which are used in the structure design are reported. E.A.K.

N84-32828*# TRW, Inc., Redondo Beach, Calif. Energy Development Group.
DEVELOPMENT OF PARTIALLY FLUORINATED RESIN APEX SEALS Final Report
H. E. Green, G. E. C. Chang, S. H. Powell, and K. Yates 1 Mar. 1984 33 p
(Contract NAS3-23054)
(NASA-CR-174706; NAS 1.26:174706; TRW-38603-6009-UT-00) Avail: NTIS HC A03/MF A01 CSCL 11A

Partially fluorinated polyimides were prepared and molded in

the form of discs and pins for test as potential apex seal materials for advanced rotary combustion engines. The polyimides were formulated from the diamine 2,2-bis 4-(4-aminophenoxy)phenyl hexafluoropropane (4-BDAF) and the dianhydrides of pyromellitic acid (PMDA) and benzophenonetetracarboxylic acid (BTDA). Tribological testing was performed at sliding speeds of 0.31 to 11.6 m/s and at temperatures of from 298K to 573K. It is shown that the carbon fiber filled polyimides, particularly the 80/20 compositions, have an excellent balance of wear/friction at 573K. The unfilled, 60/20 and 60/40 compositions indicate an unusual combination of high friction and low wear which may be advantageous in such applications as brakes and traction drives. E.A.K.

N84-32829*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MATERIALS TESTING OF THE IUS TECHROLL SEAL MATERIAL
Ronald L. Nichols and William B. Hall (Mississippi State Univ.) Jul. 1984 20 p
(NASA-TM-86462; NAS 1.15:86462) Avail: NTIS HC A02/MF A01 CSCL 11A

As a part of the investigation of the control system failure Inertial Upper Stage on IUS-1 flight to position a Tracking and Data Relay Satellite (TDRS) in geosynchronous orbit, the materials utilized in the techroll seal are evaluated for possible failure models. Studies undertaken included effect of temperature on the strength of the system, effect of fatigue on the strength of the system, thermogravimetric analysis, thermomechanical analysis, differential scanning calorimeter analysis, dynamic mechanical analysis, and peel test. The most likely failure mode is excessive temperature in the seal. In addition, the seal material is susceptible to fatigue damage which could be a contributing factor. M.A.C.

N84-32830# Science Applications, Inc., McLean, Va. Robotics and Automation Div.
PARTS ON DEMAND: EVALUATION OF APPROACHES TO ACHIEVE FLEXIBLE MANUFACTURING SYSTEMS FOR NAVY PARTS ON DEMAND, VOLUME 1
Feb. 1984 94 p
(Contract N00014-82-C-0845)
(AD-A143248) Avail: NTIS HC A05/MF A01 CSCL 05/1

The scope of this study, sponsored by the Office of Naval Research and the Naval Supply Systems Command, focused on reducing spare part supply and procurement problems by using a Parts-on-Demand (POD) system that was defined by the study in these terms: a concept using advanced manufacturing technology to produce parts as needed and to reduce cost and production lead time in small batch production. The solution approach is based on using advanced manufacturing technologies capable of reducing cost and production lead time for low volume manufacturing. A major national program, using the concept of POD, is recommended to advance design, fabrication, test, and assembly technology for low volume production. The Navy POD program objectives were developed to foster a transition to very flexible manufacturing by encouraging both changes in vendor's manufacturing technology to support low volume production and in military supply system policy and practices to more effectively employ its benefits. The emphasis of this study was on the technological issues involved and the role the Navy can play in stimulating research and development needed to advance manufacturing technology to support flexible manufacturing system to produce low volume replenishment parts. POD, however, is not to be imagined as a stand-alone system and will certainly not work in isolation. It must be gradually integrated into the current supply and procurement system, and modifications in policy and practice will be required for its effective implementation. GRA

N84-32831# Naval Ship Research and Development Center, Annapolis, Md. Propulsion and Auxiliary Systems Dept.
FRICTION AND WEAR STUDIES OF LIQUID METAL WETTED, METALLIC FIBER BRUSHES
N. A. Sondergaard and P. B. Clarke Jun. 1984 32 p
(ZR0-0001)
(AD-A143473; DTNSRDC/PAS-84-12) Avail: NTIS HC A03/MF A01 CSCL 11/6

Metallic fiber brushes wetted with a liquid metal could potentially provide a current collector for large scale homopolar machinery. This study deals with the investigation of brushes composed of Niobium fibers in a copper matrix and wetted with the liquid metal, Nak78. Four brushes with different fiber diameters and packing densities have been studied. Brushes have been characterized according to stiffness and values of the coefficient of friction for both dry and Nak78 wetted brushes have been obtained. Preliminary wear studies indicate that if brush bounce can be avoided, lifetime should be suitable. Author (GRA)

N84-32832# Naval Postgraduate School, Monterey, Calif.
REPORT OF TESTS OF A COMPRESSOR CONFIGURATION OF CD (CONTROLLED DIFFUSION) BLADING M.S. Thesis
Y. Koyuncu Mar. 1984 198 p
(AD-A143499) Avail: NTIS HC A09/MF A01 CSCL 13/7

Results of 14 tests in a subsonic cascade are reported in which the air inlet angle and Reynolds number were varied. The cascade contained 20 Controlled Diffusion (CD) blades, with 5.01 inches chord, aspect ratio of 2.0 and solidity of 1.67. Pneumatic probe surveys and surface pressure measurements were used to obtain blade performance and flow quality data. There was no measurable influence of the Reynolds number on the blade losses in the range of Re. = 474000 to Re. = 690000. Fourteen tests, using seven different inlet air angles over a range of 24 to 46 degrees generated generally well behaved blade performance parameters. The results were compared with previous results from a corresponding cascade of DCA blades.
Author (GRA)

N84-32833# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
ENGINE WEAR WITH METHANOL FUEL IN A NITROGEN-FREE ENVIRONMENT Interim Report, May - Dec. 1983
D. W. Naegeli, D. M. Yost, and E. C. Owens, Jr. May 1984 37 p
(Contract DAAK70-82-C-0001)
(AD-A143530; AFLRL-175) Avail: NTIS HC A03/MF A01 CSCL 21/4

Several test programs have shown that the combustion of methanol in spark ignition engines can cause unusually high corrosive wear of the upper cylinder bore and ring areas. In this study, a 2.3-liter engine fueled with methanol was operated in a nitrogen-free atmosphere to determine the importance of nitric acid in the corrosion mechanism. A 20-hour steady-state test was carried out using neat methanol as the fuel and a mixture of oxygen, argon, and carbon dioxide in place of air. The intake and exhaust gases were frequently analyzed to be sure their compositions were constant and free of nitrogen. Emission measurements showed only trace amounts (1 ppm) of NOx in the exhaust. Analysis of the condensates from the exhaust and blow also showed that the wear indicated by iron buildup in the lubricant was essentially the same in the nitrogen-free test as that detected in baseline engine tests combusting methanol-air mixtures. It was concluded that nitric acid does not play a role in the corrosion of the upper cylinder bore and ring areas of methanol-fueled engines.
Author (GRA)

N84-32834# Department of the Navy, Washington, D. C.
ADJUSTABLE SELF-RELEASING HOOK Patent Application
B. W. Piercy, inventor (to Navy) Filed 2 May 1984 9 p
(AD-D011082; US-Patent-Appl-SN-606011) Avail: NTIS HC A02/MF A01 CSCL 13/5

This invention relates to automatic hook releasing assemblies and more particularly to a self-releasing hook which is adjustable in the setting of its release load and which makes allowances for the use of variable rigging hardware and the resultant variable loads at which it is desired that the hook self release. The adjustable self-releasing hook consists of a pivoting hook designed to automatically release a load and its rigging hardware once the load is set in place. Variations in rigging hardware weights are accommodated by an adjustable tension spring. A safety lock pin

is incorporated to prevent accidental release, and the hook is designed to reduce the risk of fouling on cables, wires, etc., once the load is released. GRA

N84-32835# Department of the Navy, Washington, D. C.
HYBRID SEAL Patent Application
R. M. Banas and J. W. Kenyon, inventors (to Navy) Filed 2 Sep. 1983 7 p
(AD-D011083; US-Patent-Appl-SN-528905) Avail: NTIS HC A02/MF A01 CSCL 11/1

The present invention generally relates to sealing members and more particularly to a fluid sealing member that has both a dynamic seal and a static seal. The seals form a barrier between oil and ambient air. A hybrid sealing member has a sleeve with an inner surface dynamic seal and an outer surface static seal. The inner surface of the sleeve utilizes a plurality of quad ring seals having sides with undulations. The outer sleeve surfaces has a groove that holds an O-ring seal. Backup rings can be provided for both the quad rings and the O-rings to prevent slippage of the rings. Author (GRA)

N84-32836# Department of the Air Force, Washington, D.C.
SHAFT POSITIONING DEVICE Patent Application
G. N. Bonadies, inventor (to Air Force) Filed 11 Apr. 1984 20 p
(AD-D011087; US-Patent-Appl-SN-598780) Avail: NTIS HC A02/MF A01 CSCL 13/3

This abstract describes apparatus for stopping a rotating shaft at a distinct position intermediate two end stop positions. Paddle on rotating shaft cooperates with intermediate stop assembly to arrest bi-directional shaft rotation at an intermediate point when such stopping is desired, the intermediate stop assembly being transparent when intermediate stopping is not desired. GRA

N84-32837# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
MICROSTRUCTURAL ANALYSIS FOR SERIES 300 STAINLESS STEEL SHEET WELDS AND TENSILE SAMPLES
R. J. Gray, R. K. Holbert, Jr., and R. K. Thrasher 4 Jan. 1984 30 p refs Presented at the 16th Ann. Tech. Meeting of the International Metallographic Society, Calgary, Canada, 25 Jul. 1983
(Contracts DE-AC05-84OS-21400; W-7405-eng-26)
(DE84-008513; Y/DV-304; CONF-830759-4) Avail: NTIS HC A03/MF A01

The hot cracking susceptibility of some 300 series stainless steel welds is minimized by the presence of a small amount of delta ferrite in the microstructure. The identification and location of the delta ferrite require a highly sensitive procedure. A similar challenge is involved in the resolution of strain induced martensite. Magnetic etching, which involves the use of an iron colloid solution in a controlled magnetic field, meets many of the demands for resolving these ferromagnetic features in the microstructure. The technique produces an analog pattern with the colloid that is observed in situ with the conventionally etched microstructure and offers high resolution analysis of the ferromagnetic delta ferrite and martensite in the paramagnetic austenitic matrix. The technique, which is applied to the upper limit of the magnification of an optical metallograph, is described. DOE

N84-32838# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Technical Div.
MECHANICAL SEAL PROGRAM
G. B. Lowery 10 Nov. 1983 9 p
(Contract DE-AC09-76SR-00001)
(DE84-012421; DPST-83-951) Avail: NTIS HC A02/MF A01

The experimental plans and timing for completion of the mechanical seal program for both the slurry and transfer pumps are given. The slurry pump seal program will be completed by April 1984 with turnover of two seals in pumps to SRP Tank 15H. Transfer pump seal design will be released for plant use by May 1984. Also included are various other pump and seal related tests. DOE

N84-32839# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
HEAT TRANSFER, FLUID FLOW AND ELEMENT VAPORIZATION IN LASER WELDING Progress Report, 1 Aug. 1983 - 31 Jul. 1984
T. DebRoy Mar. 1984 25 p refs
(Contract DE-AC02-83ER-45030)
(DE84-011783; DOE/ER-45030/1) Avail: NTIS HC A02/MF A01

Alloying element vaporization rates, plasma composition and the changes in weld composition during laser welding of AISI 202 stainless steel are discussed. Iron, manganese and chromium were the most dominant species in the plasma. During laser welding it is always a difficult task to measure the temperature of the weld pool since this region is surrounded by hot plasma. A technique for the determination of weld pool temperature is presented. The relative rates of vaporization of any two elements from the molten pool can serve as an indicator of the weld pool temperature, irrespective of the element pair selected. The composition of the solidified region calculated from the measured values of vaporization rate, plasma composition and the volume of the solidified region was in good agreement with the weld composition determined by electron probe microanalysis technique. DOE

N84-32840# Argonne National Lab., Ill.
SEAMOPT: STERLING ENGINE OPTIMIZATION CODE
T. J. Heames and J. G. Daley 1984 8 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-012098; CONF-840804-13) Avail: NTIS HC A02/MF A01

The SEAMOPT code system is shown to be an efficient technique for optimizing Stirling engine design. It is demonstrated that with variations in objective, significantly different design requirements are attainable. Full engine thermodynamic and structural simulation are done during the optimization process. Several examples of the use of this code to optimize the GPU-3 engine are described. In one case efficiency was improved by over 25%. R.S.F.

N84-32841# SKF Industries, Inc., King of Prussia, Pa.
MECHANICAL INTERACTIONS OF ROUGH SURFACES Progress Report, 1 Apr. - 30 Jun. 1984
H. I. McCool Jun. 1984 59 p refs
(Contract DE-AC02-84ER-13163)
(DE84-014097; DOE/ER-13163/3) Avail: NTIS HC A04/MF A01

Mechanical interaction studies and signal processing for surface roughness parameters are reported. Rig modifications are reviewed along with the status of load fluctuation improvement efforts. The status of initial traction/film thickness tests which were conducted with both ball and roller test elements is reported. Models for the contact of rough surfaces are compared. DOE

N84-32842# GA Technologies, Inc., San Diego, Calif.
AN IMPROVED METHOD FOR THE PREDICTION OF CENTRIFUGAL COMPRESSOR ROTATIONAL-TONE NOISE
Robert G. Adams and Brian H. Bickers (National Nuclear Corp., Ltd.) Apr. 1984 9 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AT03-84SF-11963)
(DE84-013345; GA-A-17545; CONF-840804-22) Avail: NTIS HC A02/MF A01

This paper presents a method of calculating the sound power produced by the action of the impeller vanes from the design parameters of the compressor and the calculated flow loss coefficients. This method develops relationships between the non-dimensional wake width, ratio between the jet and wake velocities and the impeller loss coefficient. Fourier analysis of the resulting square wave gives an expression for the fluctuating pressure force at the impeller exit surface. This is then applied to the acoustic dipole source term derived in an earlier paper to calculate the sound power produced by the rotating impeller. DOE

N84-32843# Argonne National Lab., Ill.
UNCERTAINTY COVARIANCES IN ROBOTICS APPLICATIONS
D. L. Smith 1984 11 p refs Presented at Robotics and Remote Handling in the Nucl. Ind. Conf., Toronto, 23 Sep. 1984
(Contract W-31-109-eng-38)
(DE84-013417; CONF-840916-2) Avail: NTIS HC A02/MF A01

The application of uncertainty covariance matrices in the analysis of robot trajectory errors is explored. First, relevant statistical concepts are reviewed briefly. Then, a simple, hypothetical robot model is considered to illustrate methods for error propagation and performance test data evaluation. The importance of including error correlations is emphasized. DOE

N84-32844# California Univ., Livermore. Lawrence Livermore Lab.
EXPERIMENTAL AND MODELING STUDY OF ENGINE KNOCK
J. R. Smith (Sandia Labs., Livermore, Calif.), R. M. Green (Sandia Labs., Livermore, Calif.), C. K. Westbrook, and W. J. Pitz 19 Jan. 1984 23 p refs Presented at 20th Intern. Symp. on Combust., Ann Arbor, Mich., 12 Aug. 1984
(Contracts DE-AC04-76DP-00789; W-7405-eng-48)
(DE84-006134; UCRL-90252; CONF-840801-4) Avail: NTIS HC A02/MF A01

Raman and emission spectroscopy, laser induced fluorescence, schlieren photography, and gas sampling were used in a single cylinder, spark ignition engine to study preflame conditions and reactions that lead to knock. The intake manifold temperature and pressure were used to control the fraction of fuel autoigniting in a 5.1 compression ratio engine. N-butane, isobutane, and propane were studied, but only n-butane and isobutane were found to knock under the range of achievable inlet conditions. Detailed kinetics modeling predicts the trends in the autoignition delay times. Preflame reactions involving OH and CH radicals producing carbon monoxide, formaldehyde, and faint glue light were observed, however, the inclusion of a low temperature reaction scheme had little effect on calculated ignition delays. DOE

N84-32845# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN OF A HIGH-PERFORMANCE SLIDE AND DRIVE SYSTEM FOR A SMALL PRECISION MACHINING RESEARCH LATHE
R. R. Donaldson and A. S. Maddux Mar. 1984 21 p refs Presented at the CIRP Assembly, Madison, Wisc., 20-25 Aug. 1984
(Contract W-7405-eng-48)
(DE84-011059; UCRL-90475; CONF-840850-1) Avail: NTIS HC A02/MF A01

The development of high accuracy machine tools, principally through interest in diamond turning, plus the availability of new cutting tool materials, offers the possibility of improving workpiece accuracy for a much larger variety of materials than that addressed by diamond tools. The design and measured performance of a slideway and servodrive system is described for a small lathe intended as a tool for research, with emphasis on the servocontrol design. The slide system provides high accuracy and stiffness over a travel of 100 mm, utilizing oil hydrostatic bearings and a capstan roller drive with integral dc motor and tachometer. DOE

N84-32846# Department of Energy, Washington, D. C.
FUEL INJECTION DEVICE AND METHOD Patent Application
Larry W. Carlson, inventor (to DOE) Filed 21 Dec. 1983 20 p
(Contract W-31-109-eng-38)
(DE84-014320; US-Patent-Appl-SN-564127) Avail: NTIS HC A02/MF A01

A fuel injection system and method provide for shaping a combustion plume within a combustion chamber to effectively recirculate hot combustion gases for stable combustion conditions while providing symmetrical combustion conditions. Char and molten slag are passed to the outer boundary layer to complete combustion of char while permitting initial substoichiometric combustion in a reductive atmosphere for reducing discharge of nitrogen oxides. Shaping of the plume is accomplished by an axially adjustable pintle which permits apportionment of driving pressure between elements which contribute tangential and those which contribute radial directional components to oxidant flow entering the combustion chamber. DOE

N84-32626*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MAGNETIC REFRIGERATION DEVELOPMENT
D. D. Deardoff and D. L. Johnson *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 49-58 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-32847 United Kingdom Atomic Energy Authority, Risley (England).
ROBOTISATION OF DYE PENETRANT INSPECTION: A STUDY OF A PROTOTYPE AND ITS DEVELOPMENT
B. Lerat, J. N. Calvet, A. Dillet, and C. Reyx 5 Jul. 1984 11 p Transl. into ENGLISH from "Intern. Colloq. on In-situ Testing and Inspection of Irradiated and Inaccessible Components in Nuclear Plants" Paris, 1981 p 57-64 Colloq. held in Paris, 26-27 Nov. 1981
(BLL-Risley-Trans-4585-(9091.9)) Avail: British Library Lending Div., Boston Spa, Engl.

On Pressurized Water Reactors (PWRs) a large number of welds are initially inspected by manual dye penetrant inspection. Dye penetrant inspection is used to check the circumferential welds of the 900 mm diameter nozzles connecting the pressure vessel to the primary circuit. Robotization of this inspection process is considered with the aim of reducing the radiation exposure duration of the operation. An applicator is developed which is capable of applying the dye penetrant under remote control while at the same time providing a quality of inspection at least equivalent to that obtained manually. The applicator is positioned in relation to the welds being inspected by means of an actuator designed specifically for the purpose. With the object always of minimizing the duration of exposure of the inspectors, the operations of positioning the applicator, spraying the products, cleaning, drying, and also finally examining the welds after dye penetrant treatment are monitored by camera. Interpretation of the indications revealed can if necessary be done visually by the inspector actually at the component. M.A.C.

N84-32848 United Kingdom Atomic Energy Authority, Risley (England).
EDDY CURRENT TESTING OF STEAM GENERATOR TUBES
P. Neumaier 5 Jul. 1984 9 p refs Transl. into ENGLISH from "Intern. Colloq. on In-situ Testing and Inspection of Irradiated and Inaccessible Components in Nuclear Plants" Paris, 1981 p 45-53 Colloq. held in Paris, 26-27 Nov. 1981
(BLL-Risley-Trans-4584-(9091.9)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The eddy current method of steam generator pipe inspections of nuclear power stations is investigated. The method is expanded for application to the rolled joint zones on the tube plate, and the transition from the tube plate to the free tube. The probe hardware and inspection processes are described. M.A.C.

N84-32849*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE ROLE OF THE REFLECTION COEFFICIENT IN PRECISION MEASUREMENT OF ULTRASONIC ATTENUATION
Edward R. Generazio 1984 30 p refs Presented at the Ann. Rev. of Progr. in Quantitative Nondestructive Evaluation, La Jolla, Calif., 8-13 Jul. 1984; sponsored by DARPA

(NASA-TM-83788; E-2185; NAS 1.15:83788) Avail: NTIS HC A03/MF A01 CSCL 14D

Ultrasonic attenuation measurements using contact, pulse-echo techniques are sensitive to surface roughness and couplant thickness variations. This can reduce considerable inaccuracies in the measurement of the attenuation coefficient for broadband pulses. Inaccuracies arise from variations in the reflection coefficient at the buffer-couplant-sample interface. The reflection coefficient is examined as a function of the surface roughness and corresponding couplant thickness variations. Interrelations with ultrasonic frequency are illustrated. Reliable attenuation measurements are obtained only when the frequency dependence of the reflection coefficient is incorporated in signal analysis. Data are given for nickel 200 samples and a silicon nitride ceramic bar having surface roughness variations in the 0.3 to 3.0 microns range for signal bandwidths in the 50 to 100 MHz range. Author

N84-32850# Oklahoma State Univ., Stillwater.
DETECTION OF DAMAGE IN HYDRAULIC COMPONENTS BY ACOUSTIC EMISSION TECHNIQUES Final Report, 23 Jul. 1982 - 30 Apr. 1984
Mark Dowdican, Gabriel Silva, and R. L. Lowery Apr. 1984 157 p
(Contract DAAK70-82-C-0104)
(AD-A143262; OSU-FPRC-A5/84) Avail: NTIS HC A08/MF A01 CSCL 14/2

Acoustic Emission Instrumentation was applied to the detection of damage, wear and leakage in hydraulic pumps, valves and cylinders. The results show that these components emit signals between 20 and 90 kHz that can be correlated to leakage or damage. A literature survey and a summary of commercially available instruments are also included. Author (GRA)

N84-32851# Naval Research Lab., Washington, D. C.
AN ENTROPY MAXIMUM PRINCIPLE AND INSTANTANEOUS FAILURE STATISTICS Memorandum Report, Nov. 1983 - Mar. 1984
S. Teitler, A. K. Rajagopal, and K. L. Ngai 3 Jul. 1984 13 p
(RR0-1102)
(AD-A143299; NRL-MR-5370) Avail: NTIS HC A02/MF A01 CSCL 14/4

A Shannon entropy for instantaneous failure statistics is defined in terms of an integral over the full epoch of possible failure times. An entropy maximum principle subject only to the normalization of the probability density integral and the existence of a mean time to failure yields an exponential distribution as the fundamental probability distribution for instantaneous failure statistics. It is observed that the time scale of measurements does not necessarily coincide with the time scale on which the probability distribution takes its fundamental form. Time scale transformations are considered. The maximum entropy density is taken to be form-invariant independent of the time scale used in its description, and the resulting epoch entropy is itself taken to be an invariant. This latter invariance leads to a relation between the time unit of a transformed time scale and the time unit of the fundamental scale. The invariance relation is employed in consideration of the effect of parameter scaling in particular devices, and in the discussion of the behavior of parameters that arise in accelerated testing. Author (GRA)

N84-32852# Ames Lab., Iowa.
APPLICATION OF ELASTIC WAVE SCATTERING THEORY TO THE DETECTION AND CHARACTERIZATION OF FLAWS IN STRUCTURAL MATERIALS
R. B. Thompson 1984 14 p refs Presented at ASME Pressure Vessel and Piping Conf., San Antonio, 17 Jun. 1984
(Contract W-7405-eng-82)
(DE84-013729; IS-M-488; CONF-840647-20) Avail: NTIS HC A02/MF A01

The uses of elastic wave scattering theory in ultrasonic nondestructive evaluation are reviewed. The present understanding of the scattering from stress free, elliptical cracks in unbounded media is first summarized. This is followed by a discussion of additional problems imposed by the topography of real cracks and part surfaces. The increasing use of models in engineering applications is illustrated by examples taken from the inspection of nuclear power plant piping and pressure vessel welds and aircraft turbine engine rotor components. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-32853 Georgia Inst. of Tech., Atlanta.
NONLINEAR ELASTIC STABILITY ANALYSIS OF PLANE FRAMES Ph.D. Thesis
Andreas Vlahinos 1984 169 p
Avail: Univ. Microfilms Order No. DA8411322

The nonlinear analysis of plane elastic and orthogonal frameworks is presented. The static loading consists of both eccentric concentrated loads (near the joints) and uniformly distributed loads on all or few members. The joints can be either rigid or flexible. The flexible joint connection is characterized by connecting one member on an adjoining one through a rotational spring (with linear or nonlinear stiffness). The supports are immovable and are characterized with rotational restrain, by employing linear rotational springs. The mathematical formulation is presented in detail and the solution methodology is outlined and demonstrated through several examples. These examples include two bar frames, portal frames as well as multibay multistory frames. The emphasis is placed on obtaining sway buckling loads, prebuckling and postbuckling behaviors, whenever applicable. Dissert. Abstr.

N84-32854 Georgia Inst. of Tech., Atlanta.
RANDOM VIBRATIONS OF MULTICOMPONENT STRUCTURES Ph.D. Thesis
Emilios Dimitriadis 1984 157 p
Avail: Univ. Microfilms Order No. DA8411314

The response of coupled structural members of a complex structure subjected to random loads, is estimated by approximate methods, based on the concepts of Statistical Energy Analysis (SEA). The power flow between two coupled components is a weighted difference of the component vibrational energies. Were the weighting coefficients (Coupling Loss Factors) known for all coupled pairs of components in a complex structure, an approximate estimate of the distribution of vibrational energy could be obtained. The problem of two coupled plates is rigorously formulated and solved in terms of SEA variables. Results are presented for the power flow and vibrational energies, along with experimental measurements conducted on an L shaped aluminum plate, randomly excited by an electromagnetic vibration exciter. The analytical model can yield an understanding of the conditions under which the SEA assumptions are applicable. Both point and distributed excitation are treated, as well as simply supported and free boundary conditions. Certain approximations that render the analytical model more amenable to computations are discussed. Dissert. Abstr.

N84-32855 Michigan Univ., Ann Arbor.
SIMPLIFICATIONS IN THE SIMULATION OF MECHANISMS CONTAINING FLEXIBLE MEMBERS Ph.D. Thesis
Thomas John Wielenga 1984 159 p
Avail: Univ. Microfilms Order No. DA8412279

The equations of motion for linearly elastic bodies undergoing large displacement motion are derived. The equations of various type of joints and forces are also derived. This produces a set of equations which are efficient to numerically integrate and provides a general approach to mechanism simulation. The equations for the elastic members are formulated and simplified to provide as much efficiency as possible in their numerical solution. The

techniques used are: (1) a local frame of reference is associated with each body; (2) the equations of motion for the rotation of the frame are formulated in terms of angular velocity instead of angular coordinates; (3) by make the local reference frame float with respect to the body many of the terms in the equations are eliminated; and (4) many of the remaining terms are shown to be negligible size and are eliminated from the equations. Dissert. Abstr.

N84-32856 State Univ. of New York, Buffalo.
STRESSES AND DISPLACEMENTS IN LINEAR MAXWELL NON-ISOTHERMAL CIRCULAR PLATES ON WINKLER FOUNDATION AND WITH RADIAL AND TRANSVERSE VARIATION IN MATERIAL PROPERTIES Ph.D. Thesis
Mohamed Abdel-Aziz Elattary 1984 120 p
Avail: Univ. Microfilms Order No. DA8410544

Deflections and stresses are analyzed for nonisothermal circular plates resting on Winkler foundations and subjected to large temperature variations. The material is represented by a linear Maxwell model with radial and transverse variation in the material properties because of their temperature dependence. The general governing equations are found to be complicated integrodifferential equations which are not of the convolution type. However, by considering a temperature gradient through the thickness only, these equations are reduced to convolution type integrodifferential equations. After a Laplace transformation, the problem reduces to solving a fourth order ordinary differential equation in s-space and to inverting the results, which is done by using Schapery's method. Two specific examples are considered in detail. The first example is a uniformly loaded aluminum circular plate, clamped at the outer edge and with a linear transverse temperature distribution. The second example considers the effect of an axisymmetric intrusion on the deformation of the Earth's lithosphere. Since metals and rocks at elevated temperatures are dominated by nonlinear dislocation creep deformation, a technique for obtaining an effective viscosity coefficient is developed which allows a linear viscoelastic model to be used. Results indicate a movement of the neutral axis with time towards the colder surface and highly nonlinear stress distributions. Dissert. Abstr.

N84-32857 Illinois Univ., Chicago.
HYBRID STRESS REDUCED-MINDLIN ELEMENTS FOR THIN MULTILAYER PLATES WITH APPLICATION TO EDGE CONTACT PROBLEMS Ph.D. Thesis
Diane Marie Jakobs 1984 146 p
Avail: Univ. Microfilms Order No. DA8411329

A hybrid stress formulation of isoparametric elements for the analysis of thin multilayer laminated composite plates is presented and is applied to edge contact analyses. The element displacement behavior is characterized by laminate reference surface inplane and transverse displacements and laminate nonnormal cross section rotations; the number of degrees of freedom is independent of the number of layers. All components of stress are included and are related to a set of laminate stress parameters, the number of which is independent of the number of layers. Attention is restricted here to thin laminates, the contributions of transverse shear stress and transverse normal stress to the internal complementary strain energy can be neglected. A modified stiffness formation algorithm can be used which provides a significant improvement in computation efficiency. The formulation is used to develop an 8 note isoparametric thin multilayer plate element. The resulting element is naturally invariant, of correct rank, and nonlocking in the thin plate limit. The newly developed element is applied to the analysis of laminate edge contact. A hybrid stress formulation for the incremental/iterative analysis of contact problems and the procedure to locate the surface of contact is presented. Dissert. Abstr.

N84-32858 Pittsburgh Univ., Pa.
HORIZONTAL CYLINDRICAL VESSELS SUPPORTED BY SADDLES SUBJECTED TO VERTICAL AND LATERAL FORCE FIELDS Ph.D. Thesis
Raymond Fasiczka 1983 103 p refs
Avail: Univ. Microfilms Order No. DA8411678

Techniques are presented to determine the analytical solution of stress and displacement resultants in saddle supported vessels. The analyses and results apply to vessels in vertical and lateral force fields. Extension of the solution methods are suggested for vessels with generalized temperature distribution. Flugge's equations and Fourier series expansion technique are used with Betti's Reciprocal Theorem to determine the analytical solution resulting from the support reactions on a cylindrical shell. The support reactions are shown to be reducible to seven loading functions. Agreement is found between the analytical results and the experimental results of others. Parametric studies of the effects of loading direction, saddle angle, saddle width, radius to thickness ratio, and length to radius ratio provide sufficient nondimensional results to be used directly for design purposes. Dissert. Abstr.

N84-32859 Northwestern Univ., Evanston, Ill.
ON THE MECHANICS OF FATIGUE CRACK GROWTH DUE TO CONTACT LOADING Ph.D. Thesis
Gregory Raymond Miller 1984 58 p
Avail: Univ. Microfilms Order No. DA8411170

The results of an analysis of the propagation behavior of fatigue cracks due to contract loading are discussed. Stress intensity factors are computed for a surface breaking crack in the presence of a near surface inclusion, and under the influence of interacting asperities at the surface. Using the growth law of McEvily and Foreman, crack propagation is studied as a function of the calculated model II stress intensity range delta k(sub II). Crack arrest is examined, the role of inclusions demonstrated, and a single-crack load/life calculation is performed yielding results consistent with experimental observation. Finally, stress intensity factors are computed for a subsurface crack growing from an inclusion toward the surface, and the limitations of these results are discussed. Dissert. Abstr.

N84-32860 British Library Lending Div., Boston Spa (England).
CALCULATION OF THERMAL STRESS STATE FOR COMPONENTS OF METALLURGICAL EQUIPMENT BY ELECTRIC SIMULATION
E. A. Konkov, A. P. Shalimov, Yu. S. Samsonov, and V. S. Chalkov 19 Jun. 1984 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 10, 1983 p 129-134
(BLL-M-35690-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The process of solving the problem of thermal stress state for a plate made of Steel 10 is described and illustrated. Advantages of the simulation method over the techniques using the computer are given. Author

N84-32861 British Library Lending Div., Boston Spa (England).
FREE BULGING OF ROUND DIAPHRAGM EXPOSED TO UNIFORM PRESSURE IN STATE OF CREEP
V. A. Panamarev 19 Jun. 1984 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 10, 1983 p 64-66
(BLL-M-35680-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

To determine the stress-strain state arising during the initial stage of drawing in the process of sheet stamping, the free bulging of a round diaphragm clamped around its contour and exposed to uniform pressure in conditions of creep was investigated. Relations of the momentless theory of shells are used and the condition of incompressibility of the material are considered. A calculation procedure is proposed which reduces the problem of determining the stress-strain state to a boundary problem which can be solved numerically on a computer. Author

N84-32862*# Rocketdyne, Canoga Park, Calif. Materials Engineering and Technology.
RETARDATION ANALYTICAL MODEL TO EXTEND SERVICE LIFE Monthly Technical Progress Narrative, Aug. 1984
D. Matejczyk 8 Sep. 1984 8 p
(Contract NAS8-35507)
(NASA-CR-173891; NAS 1.26:173891) Avail: NTIS

HC A02/MF A01 CSCL 20K

A fatigue crack growth model that incorporates crack growth retardation effects and is applicable to the materials characteristics and service environments of high performance LH2/LO2 engine systems was developed and tested. Author

N84-32863*# Lehigh Univ., Bethlehem, Pa.
CRACK PROBLEMS FOR BONDED NONHOMOGENEOUS MATERIALS UNDER ANTIPLANE SHEAR LOADING
F. Erdogan Sep. 1984 19 p refs
(Grant NGR-39-007-011)
(NASA-CR-173892; NAS 1.26:173892) Avail: NTIS HC A02/MF A01 CSCL 20K

The singular nature of the crack tip stress field in a nonhomogeneous medium with a shear modulus with a discontinuous derivative was investigated. The simplest possible loading and geometry, the antiplane shear loading of two bonded half spaces in which the crack is perpendicular to the interface is considered. It is shown that the square root singularity of the crack tip stress field is unaffected by the discontinuity in the derivative of the shear modulus. The problem is solved for a finite crack and results for the stress intensity factors are presented. E.A.K.

N84-32864*# Computer Software Management and Information Center, Athens, Ga.
TWELFTH NASTRAN USERS' COLLOQUIUM
Washington Aug. 1984 261 p refs Colloq. held in Orlando, Fla., 7-11 May 1984 Prepared in cooperation with Georgia Univ., Athens
(NASA-CP-2328; NAS 1.55:2328) Avail: NTIS HC A12/MF A01 CSCL 20K

NASTRAN is a large, comprehensive, nonproprietary, general purpose finite element computer code for structural analysis. The Twelfth Users' Colloquim provides some comprehensive papers on the application of finite element methods in engineering, comparisons with other approaches, unique applications, pre and post processing or auxiliary programs, and new methods of analysis with NASTRAN. For individual titles, see N84-32865 through N84-32876.

N84-32865*# Sperry Systems Management, Huntsville, Ala.
COSMIC/NASTRAN FREE-FIELD INPUT
Gordon C. Chan *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 1-10 (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

A user's guide to the COSMIC/NASTRAN free field input for the Bulk Data section of the NASTRAN program is proposed. The free field input is designed to be user friendly and the user is not forced out of the computer system due to input errors. It is easy to use, with only a few simple rules to follow. A stand alone version of the COSMIC/NASTRAN free field input is also available. The use of free field input is illustrated by a number of examples. Author

N84-32866*# RPK Corp., Athens, Ga.
THE DESIGN AND USAGE OF THE NEW DATA MANAGEMENT FEATURES IN NASTRAN
P. R. Pamidi and W. K. Brown *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 11-25 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

Two new data management features are installed in the April 1984 release of NASTRAN. These two features are the Rigid Format Data Base and the READFILE capability. The Rigid Format Data Base is stored on external files in card image format and can be easily maintained and expanded by the use of standard text editors. This data base provides the user and the NASTRAN maintenance contractor with an easy means for making changes to a Rigid Format or for generating new Rigid Formats without unnecessary compilations and link editing of NASTRAN. Each Rigid Format entry in the data base contains the Direct Matrix Abstraction Program (DMAP), along with the associated restart, DMAP sequence subset and substructure control flags. The READFILE capability allows an user to reference an external secondary file from the NASTRAN primary input file and to read data from this secondary file. There is no limit to the number of external secondary files that may be referenced and read. Author

N84-32867*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACCURACY OF THREE DIMENSIONAL SOLID FINITE ELEMENTS
W. R. Case and R. E. Vandegrift *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 26-46 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

The results of a study to determine the accuracy of the three dimensional solid elements available in NASTRAN for predicting displacements is presented. Of particular interest in the study is determining how to effectively use solid elements in analyzing thick optical mirrors, as might exist in a large telescope. Surface deformations due to thermal and gravity loading can be significant contributors to the determination of the overall optical quality of a telescope. The study investigates most of the solid elements currently available in either COSMIC or MSC NASTRAN. Error bounds as a function of mesh refinement and element aspect ratios are addressed. It is shown that the MSC solid elements are, in general, more accurate than their COSMIC NASTRAN counterparts due to the specialized numerical integration used. In addition, the MSC elements appear to be more economical to use on the DEC VAX 11/780 computer. Author

N84-32868*# RPK Corp., Athens, Ga.
COSMIC/NASTRAN ON THE CRAY COMPUTER SYSTEMS
W. K. Brown and P. R. Pamidi *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 47-53 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

COSMIC/NASTRAN was converted to the CRAY computer systems. The CRAY version is currently available and provides users with access to all of the machine independent source code of COSMIC/NASTRAN. Future releases of COSMIC/NASTRAN will be made available on the CRAY soon after they are released by COSMIC. Author

N84-32869*# Gates Learjet Corp., Wichita, Kans.
COMPUTER AIDED MODELING AND POST PROCESSING WITH NASTRAN ANALYSIS
Robert R. Boroughs *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 54-77 ref (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

Computer aided engineering systems are invaluable tools in performing NASTRAN finite element analysis. These techniques are implemented in both the pre-processing and post-processing phases of the NASTRAN analysis. The finite element model development, or pre-processing phase, was automated with a computer aided modeling program called Supertabl, and the review and interpretation of the results of the NASTRAN analysis, or post-processing phase, was automated with a computer aided plotting program called Output Display. An intermediate program, Nasplot, which was developed in-house, has also helped to cut down on the model checkout time and reduce errors in the model. An interface has been established between the finite element computer aided engineering system and the Learjet computer aided design system whereby data can be transferred back and forth between the two. These systems have significantly improved productivity and the ability to perform NASTRAN analysis in response to product development requests. Author

N84-32870*# Butler Analyses, Towson, Md.
DESIGN SPECTRUM ANALYSIS IN NASTRAN
Thomas G. Butler *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984

p 78-91 (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

The utility of Design Spectrum Analysis is to give a mode by mode characterization of the behavior of a design under a given loading. The theory of design spectrum is discussed after operations are explained. User instructions are taken up here in three parts: Transient Preface, Maximum Envelope Spectrum, and RMS Average Spectrum followed by a Summary Table. A single DMAP ALTER packet will provide for all parts of the design spectrum operations. The starting point for getting a modal break-down of the response to acceleration loading is the Modal Transient rigid format. After eigenvalue extraction, modal vectors need to be isolated in the full set of physical coordinates (P-sized as opposed to the D-sized vectors in RF 12). After integration for transient response the results are scanned over the solution time interval for the peak values and for the times that they occur. A module called SCAN was written to do this job, that organizes these maxima into a diagonal output matrix. The maximum amplifier in each mode is applied to the eigenvector of each mode which then reveals the maximum displacements, stresses, forces and boundary reactions that the structure will experience for a load history, mode by mode. The standard NASTRAN output processors have been modified for this task. It is required that modes be normalized to mass. R.J.F.

N84-32871*# Butler Analyses, Towson, Md.
SEISMIC ANALYSIS CAPABILITY IN NASTRAN
Thomas G. Butler and Robert F. Strang (Computer Sciences Corp.) *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 92-131 (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

Seismic analysis is a technique which pertains to loading described in terms of boundary accelerations. Earthquake shocks to buildings is the type of excitation which usually comes to mind when one hears the word seismic, but this technique also applied to a broad class of acceleration excitations which are applied at the base of a structure such as vibration shaker testing or shocks to machinery foundations. Four different solution paths are available in NASTRAN for seismic analysis. They are: Direct Seismic Frequency Response, Direct Seismic Transient Response, Modal Seismic Frequency Response, and Modal Seismic Transient Response. This capability, at present, is invoked not as separate rigid formats, but as pre-packaged ALTER packets to existing RIGID Formats 8, 9, 11, and 12. These ALTER packets are included with the delivery of the NASTRAN program and are stored on the computer as a library of callable utilities. The user calls one of these utilities and merges it into the Executive Control Section of the data deck to perform any of the four options are invoked by setting parameter values in the bulk data. R.J.F.

N84-32872*# Rockwell International Corp., Pittsburgh, Pa. Shuttle Integration and Satellite Systems Div.
TRANSIENT RESPONSE DYNAMIC MODULE MODIFICATIONS TO INCLUDE STATIC AND KINETIC FRICTION EFFECTS
J. E. Misel, S. B. Nenno, and D. Takahashi *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 132-160 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

A methodology that supports forced transient response dynamic solutions when both static and kinetic friction effects are included in a structural system model is described. Modifications that support this type of nonlinear transient response solution are summarized for the transient response dynamics (TRD) NASTRAN module. An overview of specific modifications for the NASTRAN processing subroutines, INITL, TRD1C, and TRD1D, are described with further details regarding inspection of nonlinear input definitions to define the type of nonlinear solution required, along with additional initialization requirements and specific calculation subroutines to successfully solve the transient response problem. The extension of the basic NASTRAN nonlinear methodology is presented through several stages of development to the point where constraint equations and residual flexibility effects are introduced into the finite difference Newmark-Beta recurrsion formulas. Particular emphasis is placed on cost effective solutions for large finite element models such as the Space Shuttle with friction degrees of freedom between the orbiter and payloads mounted in the cargo bay. An alteration to the dynamic finite difference equations of motion is discussed, which allows one to include friction effects at reasonable cost for large structural systems such as the Space Shuttle. Data are presented to indicate the possible impact of transient friction loads to the payload designer for the Space Shuttle. Transient response solution data are also included, which compare solutions without friction forces and those with friction forces for payloads mounted in the Space Shuttle cargo bay. These data indicate that payload components can be sensitive to friction induced loads. R.J.F.

N84-32873*# Tennessee Eastman Corp., Oak Ridge.
STRUCTURAL ANALYSIS OF THE SUPPORT SYSTEM FOR A LARGE COMPRESSOR DRIVEN BY A SYNCHRONOUS ELECTRIC MOTOR
J. Ronald Winter *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 161-191 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

For economic reasons, the steam drive for a large compressor was replaced by a large synchronous electric motor. Due to the resulting large increase in mass and because the unit was mounted on a steel frame approximately 18 feet above ground level, it was deemed necessary to determine if a steady state or transient vibration problem existed. There was a definite possibility that a resonant or near resonant condition could be encountered. The ensuing analysis, which led to some structural changes as the analysis proceeded, did not reveal any major steady state vibration problems. However, the analysis did indicate that the system would go through several natural frequencies of the support structure during start-up and shutdown. This led to the development of special start-up and shutdown procedures to minimize the possibility of exciting any of the major structural modes. A coast-down could result in significant support structure and/or equipment damage, especially under certain circumstances. In any event, dynamic field tests verified the major analytical results. The unit has now been operating for over three years without any major vibration problems. Author

N84-32874*# Naval Ship Research and Development Center, Bethesda, Md.
FINITE ELEMENT PREDICTION OF ACOUSTIC SCATTERING AND RADIATION FROM SUBMERGED ELASTIC STRUCTURES
G. C. Everstine, F. M. Henderson, and R. R. Lipman *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 192-209 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

A finite element formulation is derived for the scattering and radiation of acoustic waves from submerged elastic structures. The formulation uses as fundamental unknowns the displacement in the structure and a velocity potential in the field. Symmetric coefficient matrices result. The outer boundary of the fluid region is terminated with an approximate local wave-absorbing boundary condition which assumes that outgoing waves are locally planar. The finite element model is capable of predicting only the near-field acoustic pressures. Far-field sound pressure levels may be determined by integrating the surface pressures and velocities over the wet boundary of the structure using the Helmholtz integral. Comparison of finite element results with analytic results show excellent agreement. The coupled fluid-structure problem may be solved with general purpose finite element codes by using an analogy between the equations of elasticity and the wave equation of linear acoustics. Author

N84-32875*# Hughes Tool Co., Culver City, Calif.
NONLINEAR ANALYSIS OF A BOLTED MARINE RISER CONNECTOR USING NASTRAN SUBSTRUCTURING

Gary L. Fox *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 210-236 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

Results of an investigation of the behavior of a bolted, flange type marine riser connector is reported. The method used to account for the nonlinear effect of connector separation due to bolt preload and axial tension load is described. The automated multilevel substructing capability of COSMIC/NASTRAN was employed at considerable savings in computer run time. Simplified formulas for computer resources, i.e., computer run times for modules SDCOMP, FBS, and MPYAD, as well as disk storage space, are presented. Actual run time data on a VAX-11/780 is compared with the formulas presented. Author

N84-32876*# Aerostructures, Inc., Arlington, Va.
FOUR NEW CAPABILITIES IN NASTRAN FOR DYNAMIC AND AEROELASTIC ANALYSES OF ROTATING CYCLIC STRUCTURES
V. Elchuri and A. Michael Gallo (Bell Aerospace Textron) *In* Computer Software Management and Information Center Twelfth NASTRAN Users' Colloq. Aug. 1984 p 237-256 refs (For primary document see N84-32864 22-39)
Avail: NTIS HC A12/MF A01 CSCL 20K

Static aerothermoelastic design/analysis of axial-flow compressors, modal flutter analysis of axial-flow turbomachines, forced vibration analysis of rotating cyclic structures and modal flutter analysis of advanced turbopropellers with highly swept blades are four new capabilities developed and implemented in NASTRAN Level 17.7. The contents, applicability and usefulness of these capabilities which were developed and documented under the sponsorship of NASA's Lewis Research Center are discussed. Overall flowcharts and selected examples are presented. R.J.F.

N84-32877*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OPENING OF AN INTERFACE FLAW IN A LAYERED ELASTIC HALF-PLANE UNDER COMPRESSIVE LOADING
John M. Kennedy, W. B. Fichter, and James G. Goree (Clemson Univ.) Aug. 1984 71 p refs
(NASA-TM-86282; NAS 1.15:86282) Avail: NTIS HC A04/MF A01 CSCL 20K

A static analysis is given of the problem of an elastic layer perfectly bonded, except for a frictionless interface crack, to a dissimilar elastic half-plane. The free surface of the layer is loaded by a finite pressure distribution directly over the crack. The problem is formulated using the two dimensional linear elasticity equations. Using Fourier transforms, the governing equations are converted to a pair of coupled singular integral equations. The integral equations are reduced to a set of simultaneous algebraic equations by expanding the unknown functions in a series of Jacobi polynomials and then evaluating the singular Cauchy-type integrals. The resulting equations are found to be ill-conditioned and, consequently, are solved in the least-squares sense. Results from the analysis show that, under a normal pressure distribution on the free surface of the layer and depending on the combination of geometric and material parameters, the ends of the crack can open. The resulting stresses at the crack-tips are singular, implying that crack growth is possible. The extent of the opening and the crack-top stress intensity factors depend on the width of the pressure distribution zone, the layer thickness, and the relative material properties of the layer and half-plane. R.J.F.

N84-32878# Aeronautical Research Labs., Melbourne (Australia).
THE NEED FOR BIAXIAL FATIGUE TESTING AT A.R.L.
J. M. Finney and P. W. Beaver May 1984 21 p
(AD-A143203; ARL/STRUC-TM-380) Avail: NTIS HC A02/MF A01 CSCL 14/2

The need for biaxial fatigue testing at ARL (Aeronautical Research Laboratories) is discussed. The acquisition of a facility is based on the grounds of improving fatigue and fracture prediction in aircraft, and enhancing ARL's capability of responding to service problems. Partial Contents: Regions of Multidirectional Stress in Aircraft; Multiaxial Fatigue and Fiber Composite Materials; Current Tasks for Which a Biaxial Test Facility is Essential or Desirable; and Proposed Biaxial Fatigue Machine. GRA

N84-32879# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Mechanik.
ANALYSIS OF PARAMETRICALLY EXCITED LARGE VIBRATION SYSTEMS Final Technical Report, 1979 - 1983
G. Schweitzer and F. Meyer Jun. 1984 177 p
(Contract DAJA37-81-C-0053; DA Proj. 1T1-61102-BH-57)
(AD-A143283) Avail: NTIS HC A09/MF A01 CSCL 20/11

Parametrically excited vibration systems are described by linear differential equations with periodic coefficients. The stability of such systems can be characterized by the stable and unstable regions in the plane of two significant system parameters, epsilon and omega. Here, omega is preferably the fundamental frequency of the parametric excitation. The stability investigation of parametrically excited systems is based on the characteristic exponents or on the characteristic multipliers. Obtaining the stability chart by a pointwise analysis based on Floquet theory for a net of points meshed over the parameter plane is a very expensive computer task. The objective of this work is the reduction of this unbearable high computer time consumption by the combination of the Floquet theory, perturbation analysis and numerical methods. This analytical/numerical method provides effective procedures for the stability investigation of large parametrically excited vibration systems. GRA

N84-32880# Washington Univ., Seattle. Dept. of Mechanical Engineering.
ANALYSIS OF DYNAMIC MIXED-MODE CRACK TIP STRESS PATTERNS
M. Ramulu, D. B. Barker, and A. S. Kobayashi May 1984 36 p
(Contract N00014-76-C-0060)
(AD-A143329; UWA/DME/TR-84/49) Avail: NTIS HC A03/MF A01 CSCL 20/11

The mixed-mode, elasto-dynamic state of stresses in the neighborhood of a rapidly running crack tip has been used to develop a relation between the isochromatic fringe order and its position parameters. The maximum shear stress is expressed in terms of the stress intensity factors and other higher order terms involving the mixed-mode loading for a crack propagating at constant velocity. A graphics package based on these derivations was developed for mapping the isochromatics in the vicinity of a running crack tip and was used to illustrate typical mixed-mode isochromatics. GRA

N84-32881# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DYNAMICS OF ANGULAR MOVEMENTS OF A SOLID SUPPORTING A ROTATING ROTOR WITH CONSIDERATION OF ENERGY DISSIPATION
V. A. Grobov and I. I. Kantemir 6 Jul. 1984 12 p Transl. into ENGLISH from Mat. Fiz. (USSR), no. 11, 1972 p 8-14
(AD-A143349; FTD-ID(RS)T-0296-84) Avail: NTIS HC A02/MF A01 CSCL 20/11

This report discusses the dynamics of angular movements of a solid supporting a rotating rotor. The motion of a system is analyzed consisting of a solid B with mass M, rotor B' with mass M' and two passive dampers B and B', each which consists of a spring and mass placed into a tube filled with a viscous fluid. Equations of motion are formulated for this system. The schematic of this system is illustrated. B.W.

N84-32882# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
SIMPLE EXAMPLES OF NON LINEAR TRUSS BEHAVIOR
P. G. Hodge, Jr. Aug. 1983 32 p
(Contract N00014-75-C-0177)
(AD-A143368; AEM-H2-2) Avail: NTIS HC A03/MF A01 CSCL 20/11

Nonlinear material models are defined to represent elastic/perfectly-plastic and elastic/buckling behavior. A simple three-bar

truss is used to demonstrate that under a monotonically increasing prescribed displacement the truss may exhibit reverse stressing or non-uniqueness, and that when two different control displacements are applied the principal of superposition does not hold.
Author (GRA)

N84-32883# Sandia Labs., Albuquerque, N. Mex.
FAILURE PREDICTION OF NOTCHED PRESSURE VESSELS USING THE CTOD APPROACH
Gerald W. Wellman, Stanley T. Rolfe (Kansas Univ., Lawrence), and Robert H. Dodds (Kansas Univ., Lawrence) 1984 11 p refs Presented at the ASME Pressure Vessel and Piping Conf., San Antonio, 17 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE84-013057; SAND-84-1297C; CONF-840647-18) Avail: NTIS HC A02/MF A01

There is a wide range of material behavior where elastic-plastic fracture mechanics analysis is applicable. The application of the crack tip opening displacement (CTOD) elastic-plastic fracture parameter to predict burst pressure is discussed. A series of burst tests performed on notched pressure vessels was analyzed. The tested vessels exhibited behavior ranging from very brittle to entirely ductile. The British Welding Institute approach as well as the finite element method were used to obtain the analytical burst pressures for each vessel. Predictions of burst pressure obtained using the British Welding Institute design approach and the finite analysis element method are compared with the actual experimental burst pressures. Burst pressures computed using nonlinear finite element analyses agree to within seven percent of experimental burst pressures in each case. The predicted burst pressures based on finite element computations are significantly more accurate than those predicted using the British Welding Institute approach. DOE

N84-32884# Brookhaven National Lab., Upton, N. Y. Structural Analysis Div.
THE DEVELOPMENT OF METHODS TO PREDICT BOTH THE DYNAMIC AND THE PSEUDO-STATIC RESPONSE OF SECONDARY STRUCTURES SUBJECTED TO SEISMIC EXCITATIONS
M. Subudhi and P. Bezler 1984 5 p refs Presented at the 5th American Society of Civil Engineers/Engineering Mechanics Spec. Conf., Laramie, Wyo., 1 Aug. 1984
(Contract DE-AC02-76CH-00016)
(DE84-010284; BNL-NUREG-34545; CONF-840833-3) Avail: NTIS HC A02/MF A01

Multiple independent support excitation time history formulations were used to investigate simplified methods to predict the inertial (or dynamic) component of response as well as the pseudo-static (or static) component of response of secondary structures subjected to seismic excitations. For the dynamic component, the independent response spectrum method is used with current industry practice for the modal and direction of excitation combinations being adopted and various procedures for the group combination and sequence being investigated. The SRSS combination between support groups is found to yield satisfactory results. For the static component, support grouping by elevation for preliminary design followed by support grouping by attachment point for final design assure overall safety in the design. DOE

N84-32885# Sandia Labs., Albuquerque, N. Mex. Thermophysical Properties Div.
COMPUTER SYSTEM FOR FIBER CREEP TESTING
William D. Drotning Jun. 1984 77 p ref
(Contract DE-AC04-76DP-00789)
(DE84-014453; SAND-84-1120) Avail: NTIS HC A05/MF A01

A minicomputer based data acquisition and analysis system was implemented for materials research on the long term creep and time dependent failure of fibers. The measurement system design allows for data acquisition from multiple creep test stations operating asynchronously. System control of the environment (temperature, stress, humidity) of each test station is also available. System hardware consists of a HP 1000-L series minicomputer operating under RTE-XL control linked to an HP 2250 Measurement and Control Processor based on the L-series microcomputer. The 2250 computer is configured for detection of stress loading and creep initiation, long term creep and temperature data acquisition, and detection of fiber failure, while the 1000-L computer is used for overall system operation, data analysis, and program development. An operating system for fiber testing was developed to allow the user to interactively control, examine, and modify the status and functions of the multiple test stations in real time. DOE

N84-32886# Mound Lab., Miamisburg, Ohio.
THERMAL SHOCK: HIGH TEMPERATURE HIGH ENERGY RATE TESTING
C. W. Merten 1984 10 p refs Presented at the 8th Intern. Conf. on High Energy Rate Fabrication, San Antonio, 17 Jun. 1984
(Contract DE-AC04-76DP-00053)
(DE84-014147; MLM-3134(OP); CONF-840653-4) Avail: NTIS HC A02/MF A01

Current thermal shock test practices are reviewed. Limitations are identified and requirements for improved thermal shock testing are formulated. Single cycle thermal shock of thin disks is shown to meet these requirements. Methods required to analyze single cycle high energy rate data are presented and applied to data or WC-Co disks. Theoretical temperature and stress distributions during the quench phase of the test are determined. The location of the fracture initiation site and nature of the stress distribution suggest that the proposed thermal shock configuration might be exploited to provide hot dynamic fracture toughness information.
DOE

N84-32887# Texas Univ., Austin.
FATIGUE BEHAVIOR OF LONGITUDINAL TRANSVERSE STIFFENER INTERSECTION Final Report
John D. Pass, Karl H. Frank, and Joseph A. Yura May 1983 100 p refs Sponsored in part by the Texas State Dept. of Highways and Public Transportation
(PB84-202092; CTR-3-5-79-247-5F; FHWA/TX-83/9-247-5F) Avail: NTIS HC A05/MF A01 CSCL 13B

The fatigue performance of a twin girder steel bridge is investigated. The fatigue life of the bridge is estimated using the results of field tests to determine the bridge's response to traffic loads and analytical and experimental studies to determine the fatigue performance of the structural details on the bridge. The bridge's fatigue life is controlled by the detail used at the intersection of the longitudinal transverse stiffener. The results of an experimental fatigue study of this detail and tests upon a retrofit detail designed to improve the fatigue life of the bridge are presented. The experimental fatigue results confirmed the analytically estimated poor fatigue life of the bridge by a factor of at least two. GRA

N84-32888# Texas Univ., Austin. Center for Transportation Research.
FATIGUE BEHAVIOR OF WELDED JOINTS SUBJECTED TO VARIABLE AMPLITUDE STRESSES Interim Research Report
J. M. Joehnk, K. H. Frank, and J. A. Yura Oct. 1983 102 p refs Sponsored in part by Texas State Dept. of Highways and Public Transportation
(PB84-207620; CTR-3-5-81-306-1; FHWA/TX-83/24-306-1) Avail: NTIS HC A06/MF A01 CSCL 13F

The fatigue behavior of welded steel tees loaded in cantilever bending was examined using simple variable amplitude stress waveforms. These waveforms were developed by superimposing two sine wave signals, i.e., a high frequency/low amplitude signal upon a low frequency/ high amplitude signal. The test program involved changing the relative size and frequency of these two sine signals. The goal of these tests was to determine the effect that smaller high frequency stress cycles would have upon the fatigue life associated with a major stress cycle. Author (GRA)

N84-32838*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NASTRAN STRUCTURAL MODEL FOR THE LARGE 64-METER ANTENNA PEDESTAL. PART 3: APPLICATIONS TO HYDROSTATIC BEARING OIL FILM
C. T. Chian and D. Schonfeld *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 172-183 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 20K

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-32889 Michigan Univ., Ann Arbor.
REMOTE SENSING FOR GEOBOTANICAL PROSPECTING Ph.D. Thesis
Matthew Schwaller 1984 127 p
Avail: Univ. Microfilms Order No. DA8412246

The use of plants as indicators of underlying geochemistry of geologic structure is outlined. Geobotanical prospecting assumes that excess concentrations of metal ions in the rooting zone induces predictable and identifiable responses in plants, and that plant response can be used as a guide in mineral exploration. The potential of remote sensing techniques detection of the symptoms of metal toxicity in plants was evaluated. Significant changes in leaf reflectance were found in several spectral regions. A canopy model was employed to determine whether the reflectance changes observed in isolated leaves could be generalized to the hypothetical plant ensembles generated by the canopy model. It was found that a ratio of green to blue canopy reflectance discriminates between simulated canopies of plants treated with toxic concentrations of zinc, when compared to simulated plant canopies from the control treatment. It is observed that the phenology of fall senescence is affected by anomalously high concentrations of metals in the soil. Thus as early onset of fall color change in deciduous forests may be a suitable indicator for geobotanical exploration with remote sensing. Dissert. Abstr.

N84-32890 Colorado State Univ., Fort Collins.
GEOLOGY AND ORIGIN OF THE AQUILA IRON DEPOSIT IN SOUTHWESTERN MICHOACAN, MEXICO Ph.D. Thesis
Delfino Ruyacaba-Ruiz 1983 171 p
Avail: Univ. Microfilms Order No. DA8408920

The Aquila deposit in SW Michoacan is a porphyry-related, skarn-bearing orebody of mainly magnetite and hematite, and minor sulfides at the contract between limestones and an I-type, polyphase diorite pluton in the iron province of the Sierra Madre del Sur, Mexico. In the province, hosting or associated with most ion deposites, there are Berriasian-Turonian volcanic and sedimentary rocks, of which Albian-Cenomanian limestone are ubiquitous, and late Cretaceous-early Tertiary intermediate-composition intrusives. The proposed genetic model implies exsolution of a late magmatic, Fe- and volatile-rich phase at the cupola of the dorite porphyry stock with development of a convective-advective cell in a relatively closed system. Main ore deposition took place after refracturing caused release o the main fluxing and Fe-dissolving agents, H2O, HCl, P, CO2, and S, and internal overpressure inhibiting the influx of foreign waters. The deposit is postulated, as a variety of porphyry-type systems. Dissert. Abstr.

N84-32891 Maryland Univ., College Park.
A GEOGRAPHIC INFORMATION SYSTEM FOR REGIONAL HYDROLOGIC MODELING Ph.D. Thesis
Jack Fellows 1983 298 p refs
Avail: Univ. Microfilms Order No. DA8412009

County level organizations experienced difficulties integrating remotely sensed digital data with hydrologic models. A computer based geographic information system was produced to provide a bridge between regional data bases and hydrologic models. This system was optimized to manage large regional data bases and route user specified watersheds through hydrologic models. The watershed draining to a user specified outfall cell is delineated by enhanced image processing algorithms. The user receives peak discharge estimates, statistics and maps reflecting the watershed's present conditions. The system also manipulates nonwatershed areas by inputting its manually delineated boundary. A statistical experiment was designed to evaluate the accuracy of the automatic watershed delineation algorithm and the sensitivity of mathematical model parameter estimation to digital data base resolution. A very flexible generalized inquiry system (GIS) which is used extensively by a county level government on a minicomputer was produced. Dissert. Abstr.

N84-32892*# Arizona Univ., Tucson.
INVESTIGATION OF SEVERAL ASPECTS OF LANDSAT 4/5 DATA QUALITY Quarterly Progress Report
Robert C. Wrigley, Principal Investigator 20 Aug. 1984 4 p ERTS
(Contract NCC2-234)
(E84-10024; NASA-CR-173876; NAS 1.26:173876) Avail: NTIS HC A02/MF A01 CSCL 05B

A second quadrant from the Sacramento, CA scene 44/33 acquired by LANDSAT-4 was tested for band to band resolution. Results show that all measured misregistrations are within 0.03 pixels for similar band pairs. Two LANDSAT-5 scenes (one from Corpus Christi, TX and the other from Huntsville, AL) were also tested for band to band resolution. All measured misregistrations in the Texas scene are less than 0.03 pixels. The across scan misregistration Alabama scene is -0.66 pixels and thus needs correction. A 512 x 512 pixel area of the Pacific Ocean was corrected for the pixel offsets. Modulation transfer function analysis of the San Mateo Bridge using data from the San Francisco scene was accomplished. R.S.F.

N84-32893*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
LANDSAT-4 IMAGE DATA QUALITY ANALYSIS Quarterly Progress Report, 10 May - 9 Aug. 1984
P. E. Anuta, Principal Investigator 9 Aug. 1984 4 p ERTS
(Contract NAS5-26859)
(E84-10173; NASA-CR-173852; NAS 1.26:173852; LARS-CR-080984) Avail: NTIS HC A02/MF A01 CSCL 05B

Reformatting software to handle LANDSAT 5 data in quadrant format was completed and tested. The sensor two-dimensional point spread function was estimated from scene data. Budget recalculations are discussed. Two publications done under this contract are named. R.S.F.

N84-32894*# Woods Hole Oceanographic Institution, Mass.
MAGSAT CORRELATIONS WITH GEOID ANOMALIES Final Report, 15 May 1983 - 15 May 1984
Carl Bowin, Principal Investigator 15 May 1984 16 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NAG5-321)
(E84-10190; NASA-CR-173676; NAS 1.26:173676) Avail: NTIS HC A02/MF A01 CSCL 08G

A digital data library of MAGSAT data is described and its applications and capabilities are reviewed. Polynomial trends were removed from each half-orbit in order to estimate and remove ring current effects from the data. The MAGSAT data in the Gulf of Mexico region was analyzed to define better the possible relation of the negative MAGSAT anomaly there to the negative residual

geoid anomaly in the western Gulf of Mexico. Since the shape and location of the negative magnetic anomaly are variable depending upon the particular polynomial surface and curve orders used, no definitive conclusion as to the degree of correspondance between the residual geoid and MAGSAT lithosphere anomalies is offered. R.S.F.

N84-32895*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAPPING MAGNETIZED GEOLOGIC STRUCTURES FROM SPACE: THE EFFECT OF ORBITAL AND BODY PARAMETERS
C. C. Schnetzler, P. T. Taylor, and R. A. Langel Aug. 1984 22 p refs ERTS
(E84-10191; NASA-TM-86134; NAS 1.15:86134) Avail: NTIS HC A02/MF A01 CSCL 08G

When comparing previous satellite magnetometer missions (such as MAGSAT) with proposed new programs (for example, Geopotential Research Mission, GRM) it is important to quantify the difference in scientific information obtained. The ability to resolve separate magnetic blocks (simulating geological units) is used as a parameter for evaluating the expected geologic information from each mission. The effect of satellite orbital altitude on the ability to resolve two magnetic blocks with varying separations is evaluated and quantified. A systematic, nonlinear, relationship exists between resolution and distance between magnetic blocks as a function of orbital altitude. The proposed GRM would provide an order-of-magnitude greater anomaly resolution than the earlier MAGSAT mission for widely separated bodies. The resolution achieved at any particular altitude varies depending on the location of the bodies and orientation. M.A.C.

N84-32896*# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Sciences.
PILOT STUDY AND EVALUATION OF A SMMR-DERIVED SEA ICE DATA BASE Final Report
Roger G. Barry, Mark R. Anderson, Robert G. Crane, Vincent J. Troisi, and Ron L. Weaver 30 Jun. 1984 48 p refs
(Grants NAGw-363; NSF DPP-81-7265)
(NASA-CR-175255; NAS 1.26:175255) Avail: NTIS HC A03/MF A01 CSCL 08L

Data derived from the Nimbus 7 scanning multichannel microwave radiometer (SMMR) are discussed and the types of problems users have with satellite data are documented. The development of software for assessing the SMMR data is mentioned. Two case studies were conducted to verify the SMMR-derived sea ice concentrations and multi-year ice fractions. The results of a survey of potential users of SMMR data are presented, along with SMMR-derived sea ice concentration and multiyear ice fraction maps. The interaction of the Arctic atmosphere with the ice was studied using the Nimbus 7 SMMR. In addition, the characteristics of ice in the Arctic ocean were determined from SMMR data. R.S.F.

N84-32897# Committee on Science and Technology (U. S. House).
AGRICULTURE AND WATER USE: PRESENT AND FUTURE ISSUES
Washington GPO 1984 94 p Hearing before the Subcomm. on Nat. Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., No. 65, 25 Oct. 1983
(GPO-30-599) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

National policy issues which Congress might address to insure sustained agriculture in arid and semiarid lands in the West are indicated. Possible technologies for addressing problems related to water quality, water supply, salinity of irrigated lands, and riparian land management are examined. The uses and applications of plant biotechnology for water resource management in these regions are considered. A.R.H.

N84-32898# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
QUANTITATIVE INTERPRETATION OF AEROMAGNETIC ANOMALIES IN THE SINCLINAL GANDARELA [INTERPRETACAO QUANTITATIVA DA ANOMALIA AEROMAGNETICA DO SINCLINAL GANDAERLA]
Antonio Lopes Padilha Apr. 1984 19 p refs In PORTUGUESE; ENGLISH summary Presented at the 335th Reuniao Anual da SBPC
(INPE-3070-PRE/487) Avail: NTIS HC A02/MF A01

The magnetic map from Minas Gerais State, furnished by the aerial survey realized by the scientific agreement between Brazil and Germany, shows a prominent anomaly in the Sinclinal Gandarela region (Quadrilatero Ferrifero). This anomaly was quantitatively studied with linear and non-linear inversion methods. The results obtained have significant differences from those of Dorr (1969) for the same region. Author

N84-32899# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DCP SYSTEMS AND CHARACTERISTICS
Antonio Divino Moura Nov. 1983 9 p refs Presented at the 8th UN/FAO Training Course on Appl. of Satellite Remote Sensing to Water Resources, Rome, 19 Sep. 7 Oct. 1983
(INPE-2948-PRE/431) Avail: NTIS HC A02/MF A01

Collection platforms used with the GOES and NOAA (TIROS-N) satellites are considered as well as their use for water resources. The capabilities of the ARGOS data collection system is described and the advantages of such a system are compared with characteristics of conventional systems. Types of measurement and precision for various hydrological applications are examined. Data processing and dissemination are discussed. A.R.H.

N84-32900# ZYCOR, Inc., Austin, Tex.
MANUAL AND AUTOMATED LINE GENERALIZATION AND FEATURE DISPLACEMENT Final Technical Report, Aug. 1982 - Jun. 1984
Steven Zoraster, Dale Davis, and Marc Hugus Jun. 1984 123 p (Contract DAAK70-82-C-0149)
(AD-A143250; Rept-101-43-16; ETL-0359) Avail: NTIS HC A06/MF A01 CSCL 05/2

The primary objective of this effort was to examine map compilation techniques used for manual and automated line generalization and feature displacement. Manual techniques used at several Defense Mapping Agency compilation sites are described in detail. An extensive survey of algorithms suggested in the cartographic, image processing, and computer science literature is provided. Possible criteria for evaluating algorithm performance are discussed and line generalization algorithms are ranked according to certain of these measures. Author (GRA)

N84-32901# Argonne National Lab., Ill. Energy and Environment Systems Div.
GEOLOGY, HYDROLOGY, AND MINERAL RESOURCES OF CRYSTALLINE ROCK AREAS OF THE NORTHEASTERN UNITED STATES
W. Harrison, D. Edgar, P. Barosh (Boston Coll., Mass.), J. Ebel (Boston Coll., Mass.), G. Kuecher, M. Tisue, S. Tsai, M. Winters, M. Flower (Illinois Univ., Chicago), and M. Sood (Northeastern Illinois Univ.) Oct. 1983 387 p refs Sponsored in part by Battelle Memorial Inst.
(Contract W-31-109-eng-38)
(DE84-013672; ANL/ES-136-Pt-1) Avail: NTIS HC A17/MF A01

A compendium of the available information on several topics of importance in defining the geologic setting of crystalline rocks in Maine, New Hampshire, Vermont, northeastern New York (the Adirondack Mountains), Massachusetts, Rhode Island, Connecticut, southeastern New York, northern New Jersey, and southeastern Pennsylvania including a series of maps, is presented. Crystalline rocks are defined herein as bodies of medium- to coarse-grained igneous and high-grade metamorphic rocks. Background information to assist in evaluating the geologic suitability of such rocks for isolating high-level radioactive waste is provided. Topics covered include the geologic history of the region; patterns of earthquake occurrence, earthquake magnitudes and horizontal ground accelerations, crustal stress, regional fault domains, and Holocene faulting

and vertical crustal movements; surface processes, anticipated climatic changes, and possible effects of renewed glaciation; landforms and surficial deposits; regional surface-water and ground-water hydrology; and the commercial potential of rock and mineral prospects and mines located within or near crystalline-rock complexes. DOE

N84-32902# Geological Survey, Menlo Park, Calif.
ASSESSMENT OF LOW-TEMPERATURE GEOTHERMAL RESOURCES OF THE UNITED STATES, 1982
Marshall J. Reed, ed. 1983 77 p refs
(Contract DE-AI01-77ET-28383)
(DE84-007193; USGS-CIRC-892) Avail: NTIS HC A05/MF A01

Regional heat flow and temperature gradients, methods for assessing low-temperature geothermal resources, and geothermal resorces in the Western, Central, and Eastern states are discussed. R.J.F.

N84-32903# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
BERING AIR-SEA-ICE STUDY (BASICS), FEBRUARY AND MARCH, 1981
S. A. Macklin, C. H. Pease, and R. M. Reynolds Feb. 1984 113 p refs
(PB84-196161; NOAA-TM-ERL-PMEL-52; NOAA-84051703) Avail: NTIS HC A06/MF A01 CSCL 08L

An air sea ice interaction experiment was conducted in the eastern Bering Sea during late February and early March 1981. Observations of the atmospheric surface layer were made from a buoy anchored 100 km seaward of the ice edge, from a ship steaming in the marginal ice zone (MIZ), and from an instrumented tower erected 100 km into the ice pack. During typical off ice wind conditions the atmospheric surface layer was found to warm and accelerate with passage over the MIZ. Oceanic profiles of density and temperature conducted from the ship indicated a homogeneous column seaward of the ice edge. Near surface current meter profiles conducted from the within pack station verified the presence of a sub ice logarithmic boundary layer. Tidal forces were seen to be an important component in the motion of ice floes. Author (GRA)

N84-32904# Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
GEOMORPHIC APPROACH TO HYDROGRAPH SYNTHESIS, WITH POTENTIAL FOR APPLICATION TO UNGAGED WATERSHEDS
V. P. Singh Jun. 1983 106 p refs Sponsored in cooperation with Louisiana Water Resources Research Inst.
(Contract DI-14-34-0001-2120)
(PB84-190115; OWRT-A-058-LA(1)) Avail: NTIS HC A06/MF A01 CSCL 08H

A conceptual approach, based on the work of Gupta, Waymire and Wang, is developed for synthesis of the instantaneous unit hydrograph (IUH) by employing basin geomorphology. This IUH is then employed in convolution for synthesis of the direct runoff due to a rainfall event. Because the approach contains parameters which can be determined from geomorphology, it is potentially applicable to ungaged basins. A computer model, designated as GMHS, is developed using this approach for hydrograph synthesis. The model is verified on five small agricultural watersheds. The model results compare well with observations in light of accuracy of the parameters and data. GRA

N84-32905# Iowa Univ., Iowa City. Inst. of Hydraulic Research.
AGGRADATION AND DEGRADATION AT ALLUVIAL-CHANNEL BEDS
W. F. J. Torres and S. C. Jain May 1984 152 p refs
(Grant NSF CEE-80-23003)
(PB84-201557; IIHR-274) Avail: NTIS HC A08/MF A01 CSCL 08H

Linear and nonlinear parabolic models for flows over movable beds were developed. Special attention was directed toward the aggradation process due to total-sediment-load augmentation and degradation due to either sediment-discharge diminution or base-level lowering. Analytical solutions for the characteristic parameters of aggradation and degradation processes in alluvial channels of semi-infinite and finite length subjected to both time dependent and time independent boundary conditions were obtained. The validity and limitations of the linear and nonlinear parabolic models and their corresponding solutions were assessed by means of comparison with flume data. The ranges of application for both linear and nonlinear models were established. Experiments on the evolution of the bed forms during aggradation due to a sudden increase in total sediment discharge were performed. GRA

N84-32906# Environmental Protection Agency, Cincinnati, Ohio. Environmental Monitoring and Support Lab.
CONSTRUCTION AND EVALUATION OF A FLOW TEST STAND Technical Report, Apr. 1982 - Apr. 1984
W. J. Averett, P. C. Lin, and J. F. Roesler Jun. 1984 36 p refs
(PB84-201581; EPA-600/D-84-157) Avail: NTIS HC A03/MF A01 CSCL 08H

A test stand for the examination of flow monitors in a 3-inch pipe was designed, constructed, and evaluated. The calculations necessary for the proper design are based on empirical data and are described in detail. A statistical analysis was used to estimate the error generated from various alternative methods of determining flow. Such estimates included errors in weighing, measuring liquid level, and measuring time and errors resulting from diversions of liquid from the main stream to the collection tank. The volume/time method proved not only to have the least error (+ or - 0.75 percent) of the several options that were studied, but also was amenable to monitoring fluids of unknown densities. The data from the flow test stand which are based on a magnetic flowmeter are traceable to the National Bureau of Standards and are reported to have errors of + or - 0.5 percent or less. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-32907 Missouri Univ., Columbia.
SCHOTTKY BARRIER AND HOMOJUNCTION GALLIUM ARSENIDE SOLAR CELLS Ph.D. Thesis
Mousa Elmabrouk Edweeb 1983 199 p
Avail: Univ. Microfilms Order No. DA8412765

New techniques were developed to construct Schottky barrier and homojunction solar cells on GaAs substrates. Schottky barrier metal semiconductor solar cells were produced for the first time on p-type GaAs substrate using a sputter deposition method to form the barrier. The sputter deposition of gold or gold/palladium is the key to the method since normal thermal evaporation of gold onto p-type GaAs produces ohmic contacts. The results of this investigation are consistent with the idea that sputter damage produces donor type surface states on GaAs. Barrier heights were measured for both p-type sputtered and n-type thermally evaporated diodes using current voltage and capacitance voltage methods. Deep level transient spectroscopy was used to identify the trap center concentration and energy levels for both diodes in an effort to explain the relatively dark current in the p-type sputtered diodes. Homojunction GaAs solar cells were fabricated using several techniques. Dissert. Abstr.

N84-32908 Department of the Air Force, Washington, D.C.
DEACTIVATION OF THIONYL CHLORIDE CELLS Patent

W. S. Bishop and R. A. Marsh, inventors (to Air Force) Issued 15 May 1984 3 p Supersedes AD-D010347
(AD-D011113; US-Patent-4,448,859; US-Patent-Appl-SN-504354; US-Patent-Class-429-50) Avail: US Patent & Trademark Office CSCL 09/1

Thionyl chloride cells are deactivated by introducing a solution of aluminum chloride in thionyl chloride into the cell. Author (GRA)

N84-32909*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEGATIVE ELECTRODE CATALYST FOR THE IRON-CHROMIUM REDOX ENERGY STORAGE SYSTEM Patent Application
R. F. Gahn and N. H. Hagedorn, inventors (to NASA) Filed 20 Aug. 1984 14 p
(NASA-Case-LEW-14028-1; NAS 1.71:LEW-14028-1; US-Patent-Appl-SN-642310) Avail: NTIS HC A02/MF A01 CSCL 10C

A redox cell which operates at elevated temperatures and which utilizes the same two metal couples in each of the two reactant fluids is disclosed. Each fluid includes a bismuth salt and may also include a lead salt. A low cost, cation permselective membrane separates the reactant fluids. NASA

N84-32910*# National Aeronautics and Space Administration. Pasadena Office, Calif.
STABLE DENSITY STRATIFICATION SOLAR POND Patent Application
Fikry L. Lansing, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 18 Oct. 1983 17 p
(Contract NAS7-100)
(NASA-Case-NPO-15419-2; NAS 1.71:NPO-15419-2; US-Patent-Appl-SN-542557) Avail: NTIS HC A02/MF A01 CSCL 10A

A stable density stratification solar pond for use in the collection and storage of solar thermal energy is disclosed. The solar pond includes a container having a first section characterized by an internal wall of a substantially cylindrical configuration and a second section having an internal wall of a substantially truncated conical configuration surmounting the first section in coaxial alignment. The second section of the container is characterized by a base of a diameter substantially equal to the diameter of the first section and a truncated apex defining a solar energy acceptance opening. A body of immiscible liquids is disposed within the container and comprises a first portion substantially filling the first section of the container and a second, aqueous based portion, substantially filling the second section of the container. The first portion is an organic based liquid of a darker color than the second portion and of a greater density. A removable protective cover plate is provided for covering the acceptance opening. NASA

N84-32911*# National Aeronautics and Space Administration. Pasadena Office, Calif.
A NEW SOLAR CELL DESIGN FOR IMPROVED OPEN CIRCUIT VOLTAGE AND HIGH EFFICIENCY Patent Application
Taher Daud (JPL, California Inst. of Tech., Pasadena) and Krishna M. Koliwad, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 23 May 1984 10 p
(Contract NAS7-100)
(NASA-Case-NPO-16126-1; NAS 1.71:NPO-16126-1; US-Patent-Appl-SN-612990) Avail: NTIS HC A02/MF A01 CSCL 10A

A silicon solar cell wherein the ratio of the p-n junction area to the total outer surface area of the cell exposed to solar radiation is reduced to provide increased open circuit voltage and improved efficiency is disclosed. The solar cell is fabricated by forming p-n junction areas in discrete spaced-apart portions of a silicon wafer. These discrete areas are spaced in any desired manner and coupled with a metal grid of narrow metal contacts. The total area of the discrete portions forming the p-n junctions is controlled to provide improved efficiency. NASA

N84-32912*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SOLAR-HEATED OIL SHALE RETORT Patent Application
Shaik A. Qader, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 23 Jul. 1984 16 p
(Contract NAS7-100)
(NASA-Case-NPO-16392-1; NAS 1.71:NPO-16392-1; US-Patent-Appl-SN-633363) Avail: NTIS HC A02/MF A01 CSCL 10A

An oil recovery process in which a bed of oil shale particles are pyrolyzed in a retort by means of a heated carrier gas stream passing through a central conduit within the bed, and then upwardly through a fixed bed or fluidized bed of the shale is disclosed. The shale is subjected to pyrolysis and evolves kerogen liquid, thermally and pyrolyzed liquids, and gases which enter the carrier gas to form a pyrolysis gas. The liquid pyrolysis oil is separated from the pyrolysis gas ion separator and a portion of the separated gas is recycled to a solar heat exchanger. There it is heated to a temperature of at least 350 C before being fed to the central conduit. NASA

N84-32913*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
BI-DIRECTIONAL CONTROL SYSTEM FOR ENERGY FLOW IN A SOLAR POWERED FLYWHEEL Patent Application
Frank J. Nola, inventor (to NASA) Filed 31 Jul. 1984 18 p
(NASA-Case-MFS-25978-1; NAS 1.71:MFS-25978-1; US-Patent-Appl-SN-636459) Avail: NTIS HC A02/MF A01 CSCL 10B

An energy storage system for a spacecraft is provided which employs a solar powered flywheel arrangement including a motor/generator which, in different operating modes, drives the flywheel and is driven thereby. A control circuit, including a threshold comparator, senses the output of a solar energy converter, and when a threshold voltage is exceeded thereby indicating the availability of solar power for the spacecraft loads, activates a speed control loop including the motor/generator so as to accelerate the flywheel to a constant speed and thereby store mechanical energy, while also supplying energy from the solar converter to the loads. Under circumstances where solar energy is not available, the control circuit deactivates the speed control loop and activates a voltage control loop that provides for operation of the motor as generator so that mechanical energy from the flywheel is converted into electrical energy for supply to the spacecraft loads. NASA

N84-32914# Pacific Northwest Lab., Richland, Wash.
VERIFICATION OF HOURLY FORECASTS OF WIND TURBINE POWER OUTPUT
H. L. Wegley Aug. 1984 35 p refs
(Contract DE-AC06-76RL-01830)
(PNL-4900) Avail: NTIS HC A03/MF A01

A verification of hourly average wind speed forecasts in terms of hourly average power output of a MOD-2 was performed for four sites. Site-specific probabilistic transformation models were developed to transform the forecast and observed hourly average speeds to the percent probability of exceedance of an hourly average power output. Semiobjective and objective (model output statistics) forecasts were made compared for the four sites. The ability to forecast the correct power output category increases with increasing power output because occurrences of high hourly average power output (near rated) are relatively rare and are generally not forecast. The semiobjective forecasts proved superior to model output statistics in forecasting high values of power output and in the shorter time frames (1 to 6 hours). However, model output statistics were slightly more accurate at other power output levels and times. Noticeable differences were observed between deterministic and probabilistic (categorical) forecast verification results. B.G.

N84-32915*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
WIND LOADING ON SOLAR CONCENTRATORS: SOME GEN-

ERAL CONSIDERATIONS
E. J. Roschke 1 May 1984 151 p refs
(Contracts NAS7-918; DE-AM04-80AL-13137)
(NASA-CR-173896; JPL-Pub-83-101; DOE/JPL-1060/66; NAS 1.26:173896) Avail: NTIS HC A08/MF A01 CSCL 10A

A survey was completed to examine the problems and complications arising from wind loading on solar concentrators. Wind loading is site specific and has an important bearing on the design, cost, performance, operation and maintenance, safety, survival, and replacement of solar collecting systems. Emphasis herein is on paraboloidal, two-axis tracking systems. Thermal receiver problems also are discussed. Wind characteristics are discussed from a general point of view. Current methods for determining design wind speed are reviewed. Aerodynamic coefficients are defined and illustrative examples are presented. Wind tunnel testing is discussed, and environmental wind tunnels are reviewed. Recent results on heliostat arrays are reviewed as well. Aeroelasticity in relation to structural design is discussed briefly. Author

N84-32916*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REVIEW OF SOLAR FUEL-PRODUCING QUANTUM CONVERSION PROCESSES
D. B. Peterson (San Diego Univ.), J. R. Biddle (California State Polytechnic Univ., Pomona), and T. Fujita 1 May 1984 87 p refs
(Contract DE-AM04-80AL-13137)
(NASA-CR-173904; JPL-Pub-84-32; DOE/JPL-1060/71; NAS 1.26:173904) Avail: NTIS HC A05/MF A01 CSCL 10A

The status and potential of fuel-producing solar photochemical processes are discussed. Research focused on splitting water to produce dihydrogen and is at a relatively early stage of development. Current emphasis is primarily directed toward understanding the basic chemistry underlying such quantum conversion processes. Theoretical analyses by various investigators predict a limiting thermodynamic efficiency of 31% for devices with a single photosystem operating with unfocused sunlight at 300 K. When non-idealities are included, it appears unlikely that actual devices will have efficiencies greater than 12 to 15%. Observed efficiencies are well below theoretical limits. Cyclic homogeneous photochemical processes for splitting water have efficiencies considerably less than 1%. Efficiency can be significantly increased by addition of a sacrificial reagent; however, such systems are no longer cyclic and it is doubtful that they would be economical on a commercial scale. The observed efficiencies for photoelectrochemical processes are also low but such systems appear more promising than homogeneous photochemical systems. Operating and systems options, including operation at elevated temperature and hybrid and coupled quantum-thermal conversion processes, are also considered. R.J.F.

N84-32917*# California State Polytechnic Univ., Pomona.
SOLAR PHOTOCHEMICAL PROCESS ENGINEERING FOR PRODUCTION OF FUELS AND CHEMICALS
J. R. Biddle, D. B. Peterson, and T. Fujita (JPL) 1 May 1984 93 p refs Prepared for JPL
(Contracts NAS7-918; DE-AM04-80AL-13137)
(NASA-CR-173910; DOE/JPL-1060/72; JPL-Pub-84-31; NAS 1.26:173910; Rept-5105-130) Avail: NTIS HC A05/MF A01 CSCL 10A

The engineering costs and performance of a nominal 25,000 scmd (883,000 scfd) photochemical plant to produce dihydrogen from water were studied. Two systems were considered, one based on flat-plate collector/reactors and the other on linear parabolic troughs. Engineering subsystems were specified including the collector/reactor, support hardware, field transport piping, gas compression equipment, and balance-of-plant (BOP) items. Overall plant efficiencies of 10.3 and 11.6% are estimated for the flat-plate and trough systems, respectively, based on assumed solar photochemical efficiencies of 12.9 and 14.6%. Because of the opposing effects of concentration ratio and operating temperature on efficiency, it was concluded that reactor cooling would be necessary with the trough system. Both active and passive cooling methods were considered. Capital costs and energy costs, for both concentrating and non-concentrating systems, were determined and their sensitivity to efficiency and economic parameters were analyzed. The overall plant efficiency is the single most important factor in determining the cost of the fuel. Author

N84-32918*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A NOMOGRAPHIC METHODOLOGY FOR USE IN PERFORMANCE TRADE-OFF STUDIES OF PARABOLIC DISH SOLAR POWER MODULES
M. K. Selcuk and T. Fujita 15 Jun. 1984 61 p refs
(Contracts NAS7-918; DE-AM04-80AL-13137; JPL Proj. 5105-136)
(NASA-CR-173908; DOE/JPL-1060/74; NAS 1.26:173908) Avail: NTIS HC A04/MF A01 CSCL 10A

A simple graphical method was developed to undertake technical design trade-off studies for individual parabolic dish models comprising a two-axis tracking parabolic dish with a cavity receiver and power conversion assembly at the focal point. The results of these technical studies are then used in performing the techno-economic analyses required for determining appropriate subsystem sizing. Selected graphs that characterize the performance of subsystems within the module were arranged in the form of a nomogram that would enable an investigator to carry out several design trade-off studies. Key performance parameters encompassed in the nomogram include receiver losses, intercept factor, engine rating, and engine efficiency. Design and operation parameters such as concentrator size, receiver type (open or windowed aperture), receiver aperture size, operating temperature of the receiver and engine, engine partial load characteristics, concentrator slope error, and the type of reflector surface, are also included in the graphical solution. Cost considerations are not included. Author

N84-32919*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SURVEY OF MANUFACTURERS OF HIGH-PERFORMANCE HEAT ENGINES ADAPTABLE TO SOLAR APPLICATIONS
William B. Stine 15 Jun. 1984 39 p
(Contract DE-AM04-80AL-13137)
(NASA-CR-173911; JPL-Pub-84-46; DOE/JPL-1060/75; NAS 1.26:173911) Avail: NTIS HC A03/MF A01 CSCL 10B

The results of an industry survey made during the summer of 1983 are summarized. The survey was initiated in order to develop an information base on advanced engines that could be used in the solar thermal dish-electric program. Questionnaires inviting responses were sent to 39 companies known to manufacture or integrate externally heated engines. Follow-up telephone communication ensured uniformity of response. It appears from the survey that the technology exists to produce external-heat-addition engines of appropriate size with thermal efficiencies of over 40%. Problem areas are materials and sealing. R.J.F.

N84-32920*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MODULE UTILIZATION COMMITTEE Final Report
K. Volkmer and G. Praver Mar. 1984 21 p
(Contracts NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-173898; JPL-Pub-84-40; DOE/ET-20356/12; NAS 1.26:173898) Avail: NTIS HC A02/MF A01 CSCL 10B

Photovoltaic collector modules were declared surplus to the needs of the U.S. Dept. of Energy. The Module Utilization Committee was formed to make appropriate disposition of the surplus modules on a national basis and to act as a broker for requests for these modules originating outside of the National Photovoltaics Program. B.G.

N84-32921*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FLATE-PLATE PHOTOVOLTAIC POWER SYSTEMS HANDBOOK FOR FEDERAL AGENCIES
E. H. Cochrane, A. C. Lawson, and C. H. Savage Apr. 1984

136 p refs
(Contract DE-AI01-76ET-20356)
(NASA-CR-173901; JPL-Pub-84-35; DOE/ET-20356/14; NAS 1.26:173901) Avail: NTIS HC A07/MF A01 CSCL 10B

The primary purpose is to provide a tool for personnel in Federal agencies to evaluate the viability of potential photovoltaic applications. A second objective is to provide descriptions of various photovoltaic systems installed by different Federal agencies under the Federal Photovoltaic Utilization Program so that other agencies may consider similar applications. A third objective is to share lessons learned to enable more effective procurement, design, installation, and operation of future photovoltaic systems. The intent is not to provide a complete handbook, but rather to provide a guide for Federal agency personnel with additional information incorporated by references. The steps to be followed in selecting, procuring, and installing a photovoltaic application are given.R.J.F.

N84-32922*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STAND-ALONE FLAT-PLATE PHOTOVOLTAIC POWER SYSTEMS: SYSTEM SIZING AND LIFE-CYCLE COSTING METHODOLOGY FOR FEDERAL AGENCIES
C. S. Borden, K. Volkmer, E. H. Cochrane, and A. C. Lawson May 1984 96 p refs
(Contracts NAS7-918; DE-AI01-76ET-20356; JPL Proj. 5260-32)
(NASA-CR-173903; JPL-Pub-84-37; DOE/ET-20356/16; NAS 1.26:173903) Avail: NTIS HC A05/MF A01 CSCL 10B

A simple methodology to estimate photovoltaic system size and life-cycle costs in stand-alone applications is presented. It is designed to assist engineers at Government agencies in determining the feasibility of using small stand-alone photovoltaic systems to supply ac or dc power to the load. Photovoltaic system design considerations are presented as well as the equations for sizing the flat-plate array and the battery storage to meet the required load. Cost effectiveness of a candidate photovoltaic system is based on comparison with the life-cycle cost of alternative systems. Examples of alternative systems addressed are batteries, diesel generators, the utility grid, and other renewable energy systems. R.J.F.

N84-32923# Naval Civil Engineering Lab., Port Hueneme, Calif.
FUEL CELL POWER SYSTEMS FOR NAVY APPLICATIONS Final Report, Oct. 1981 - Nov. 1982
W. R. Major and C. R. Miles May 1984 74 p
(Z08-2901)
(AD-A143402; NCEL-TN-1696) Avail: NTIS HC A04/MF A01 CSCL 10/2

A fuel cell power plant can supply both thermal and electrical energy to a site load. The technical and economic attractiveness of using a fuel cell system for a given application depends on many factors such as: satisfying load requirements, reliability, local energy costs, and capital costs. Satisfying site load requirements cost effectively requires a properly sized fuel cell system operating in its optimum mode. A computer program was developed to simulate the dynamic input/outputs of the fuel cell system (fuel cell, auxiliary boiler, thermal storage, electrical grid) and evaluate the separate system operational costs. Using the computer simulation in an iterative method, the optimum operational mode and size of the fuel cell and thermal storage can be estimated. A life-cycle-cost analysis for a given application can be performed using current manufacturer hardware costs and energy input/output data generated from the computer simulation. Author (GRA)

N84-32924# Department of the Air Force, Washington, D.C.
SOLID STATE TETRACHLOROALUMINATE STORAGE BATTERY HAVING A TRANSITION METAL CHLORIDE CATHODE Patent Application
R. L. Vaughn, inventor (to Air Force) Filed 1 Dec. 1983 18 p
(AD-D011133; US-Patent-Appl-SN-556874) Avail: NTIS HC A02/MF A01 CSCL 10/3

In accordance with this invention, it has been found that highly efficient, lightweight, thermally activated power sources can be fabricated by utilizing a transition metal chloride such as cupric chloride, ferric chloride, or molybdenum chloride as the cathode; and a lithium metal or lithium-aluminum or lithium-silicon alloy as the anode in combination with an alkali metal tetrachloroaluminate solid electrolyte. The power source may comprise a single cell or a stack of individual cells. A typical cell is a three layered pellet composed of a lithium alloy anode, a separating alkali metal tetrachloroaluminate solid electrolyte sandwiched between the anode and a cathode which, in turn, is composed of a mixture of the transition metal chloride and graphite. The cell is totally inert until raised to its operating temperature by any conventional heating means. GRA

N84-32925# Vermont Univ., Burlington.
INFLUENCE OF THE INTERFACIAL LAYER ON ELECTROOPTICAL PROPERTIES OF HETEROJUNCTION SOLAR CELLS Final Report
R. L. Anderson 19 Oct. 1983 37 p refs
(Contract DE-FG02-79ER-0531)
(DE84-013285; DOE/ER-10531/T1) Avail: NTIS HC A03/MF A01

The influence on the photovoltaic characteristics of the interfacial (I) layers of silicon oxide which spontaneously form in heterojunction solar cells with Si as active substrate material and SnO2, In2O3 and indium-tin oxide (ITO) as windows was studied. The reported dependence of the growth rate of the I layer on the Si conductivity type was verified but the hypothesis that the increased degradation rate of cells with n-Si substrates compared to those with p-Si substrates results from field-enhanced diffusion of O2(-) ions was disproved. Preliminary results suggest that the conversion efficiency is largely controlled by the sign and quantity of interfacial charge. For large values of open circuit voltage, as required in cells of high efficiency, this charge is positive for cells using p-Si substrate and negative for n-Si based devices. The charge is apparently a result of the fabrication method. DOE

N84-32926# Midwest Research Inst., Golden, Colo.
CdS/CuInSe2 HETEROJUNCTION CELL RESEARCH
R. Noufi, R. Axton, D. Cahen, and S. K. Deb May 1984 7 p refs Presented at the 17th IEEE Photovoltaic Spec. Conf., Kissimmee, Fla., 1 May 1984
(Contract DE-AC02-83CH-10093)
(DE84-004508; SERI/TP-212-2323; CONF-840561-13) Avail: NTIS HC A02/MF A01

Fabrication and characterization of CuInSe2 thin films and fabrication and characterization CdS/CuInSe2 solar cells was investigated. The material can be deposited either or p-type with mobilities of up to 150 cm(2)/V s and carrier concentrations ranging from 10(13) to 10(20) cm(-3). The X-ray diffraction reveals a single phase with strong preferred orientation along < 211 > and < 112 > directions. The basic device structure of the cell consists of two CuInSe2 layers, and two layers of CdS. composition and electrical property measurements of the two layers were studied to illustrate the role of the two layers of CuInSe2. The methods and results and whether the two layers in an actual device can be eliminated by using a single layer of intermediate composition and electrical properties is discussed. DOE

N84-32927# Sandia Labs., Albuquerque, N. Mex.
THERMAL MODELING OF LINE FOCUS PHOTOVOLTAIC SYSTEMS
R. Beraun Apr. 1984 66 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013920; SAND-84-0703) Avail: NTIS HC A04/MF A01

The methodology and results of a detailed thermal analysis performed on two photovoltaic systems are given. System one consists of second generation, 92(0) rim angle, parabolic-cylindrical solar collector as the concentrator. System two consists of a linear Fresnel lens photovoltaic and thermal concentrator, first, a brief description of the systems under investigation and the photovoltaic process is given. Then the methodology and the mathematical algorithm involved in developing the models are presented. DOE

N84-32928# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
INVESTIGATION OF DOUBLY-FED MACHINE IN VARIABLE SPEED APPLICATIONS
24 May 1984 63 p Review meeting held in Washington, D.C., 24 May 1984
(Contract DE-AC02-81RA-50292)
(DE84-012943; CONF-8405199) Avail: NTIS HC A04/MF A01

The results of tasks regarding power factor improvement, isolation transformer and direct digital control were presented. In addition material associated with testing the variable speed generating system developed on the NASA MOD-0 wind turbine at Plumbrook, Ohio was presented. DOE

N84-32929# Midwest Research Inst., Golden, Colo.
PROCEEDINGS OF THE SOLAR THERMAL-PHOTOCHEMICAL CONVERSION WORKSHOP Solar Energy Research Inst.
David Harley Johnson, comp. and Michael Karpuk, comp. Dec. 1983 64 p Workshop held in Golden, Colo., 10-11 Jan. 1983
(Contract DE-AC02-83CH-10093)
(DE84-000089; SERI/CP-252-2026; CONF-830165) Avail: NTIS HC A04/MF A01

The possibility of combining photochemical, or photoelectrochemical processes with thermal conversion of solar energy to produce useful work was explored. Photoelectrochemistry, solar thermal technology, and the thermodynamics of quantum and thermal conversion of solar energy are reviewed. DOE

N84-32930# California Univ., Berkeley. Lawrence Berkeley Lab.
TECHNOLOGY BASE RESEARCH PROJECT FOR ELECTROCHEMICAL ENERGY STORAGE Annual Report, 1983
K. Kinoshita, ed. 18 May 1984 131 p
(Contract DE-AC03-76SF-00098)
(DE84-013877; LBL-17742) Avail: NTIS HC A07/MF A01

The establishment of this research base which supports efforts to develop electrochemical technology for electric vehicle and stationary energy storage applications is discussed. The general objective of the technology base research project is to provide advanced electrochemical systems that satisfy stringent performance and economic requirements for electric vehicle and stationary energy storage applications. The specific goal is to identify the most promising electrochemical technologies and transfer them to industry and further development and scale up. General problem areas addressed include: identification of new electrochemical couples for advanced batteries, determination of technical feasibility of the new couples, improvements in battery components and materials, establishment of engineering principles applicable to electrochemical energy storage and conversion, and the assessment of fuel cell technology for transportation applications. Applied research which will lead to superior performance and lower life-cycle cost is emphasized. The TBR project is divided into four major project elements: (1) electrochemical systems research; (2) supporting research; (3) electrochemical processes, and (4) fuel cells for vehicles. DOE

N84-32931# Sandia Labs., Albuquerque, N. Mex.
CONCENTRATING PHOTOVOLTAIC TECHNOLOGY
M. W. Edenburn 1984 16 p refs Presented at the 10th Ann. Conf. of the Solar Energy Society of Canada, Calgary, Canada, 2 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012275; SAND-84-0244C; CONF-840845-1) Avail: NTIS HC A02/MF A01

Future directions of photovoltaic concentrator technology are discussed. A current commercial Si cell module has a peak efficiency of 15.5%, and 17% has been reached with an experimental module. Advanced cells and module design improvements offer still higher efficiencies. Concentrator Fresnel lens array fields demonstrated very good electrical performance with little performance degradation. Fresnel lens arrays were commercially available and prices of $7/watt for installed one megawatt systems have been quoted. Cost projections predict that current technology concentrating PV arrays can be installed for less than $2/watt if they are manufactured in large, steady quantities. More advanced designs may cost even less. DOE

N84-32932# IBM Watson Research Center, Yorktown Heights, N.Y.
HIGH-EFFICIENCY MULTI-COLORED PHOTOVOLTAIC CELLS Final Report
H. J. Hovel Sep. 1983 156 p refs
(PB84-200575; NYSERDA-84-10) Avail: NTIS HC A08/MF A01 CSCL 10A

The objective of this project was to explore tandem/solar cell structures and methods to produce them. One was made with amorphous Si on crystalline Si. Other combinations of well-established materials such as Ge, Si, GaAs, and GaAlAs have a potential of producing solar cell efficiency in a high range (30 to 50%). The theoretical performances of several material combinations were computed under single load operation, and the effects of series and shunt resistances are shown. Computations also were made of optimal optical coatings and ohmic grid designs that are needed to construct high efficiency working devices. The epitaxial growth of GaAs, Ge AlAs and Si are then described for use in several configurations. Additionally, measurements of individual solar cells and tandem solar cells at several suns intensity (starting at one sun) are described. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-32933# Committee on Science and Technology (U. S. House).
NATIONAL ENVIRONMENTAL MONITORING
Washington GPO 1984 408 p Hearings before the Subcomm. on Nat. Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., No. 70, 19 and 26 May, 2 Jun. 1983
(GPO-28-186) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

Findings of the Council of Environmental Quality's interagency task force on environmental data and monitoring are summarized and the degree of followup on its recommendations is assessed. The quality of the data, coordination of environmental monitoring and data activities, and major issues that need to be addressed regarding monitoring of air and water quality are examined. Participation of the private sector in toxic monitoring is considered. A.R.H.

N84-32934# Radian Corp., Durham, N.C.
LOCATING AND ESTIMATING AIR EMISSIONS FROM SOURCES OF ACRYLONITRILE
Research Triangle Park, N.C. EPA Mar. 1984 70 p refs
(PB84-200609; EPA-450/4-84-007A) Avail: NTIS HC A04/MF A01 CSCL 13B

A series of documents is prepared to compile available information on sources and emissions of acrylonitrile. The information is directed towards Federal, State and local air pollution personnel and others interested in locating potential emitters of acrylonitrile and in making gross estimates of air emissions. Information is provided on: (1) the types of sources that may emit acrylonitrile, (2) process variations and release points that may be expected within these sources, and (3) available emissions information indicating the potential for chloroform release into the air from each operation. GRA

N84-32935# GCA Corp., Bedford, Mass.
LOCATING AND ESTIMATING AIR EMISSIONS FROM SOURCES OF CHLOROFORM
Research Triangle Park, N.C. EPA Mar. 1984 102 p refs
(PB84-200617; EPA-450/4-84-007C) Avail: NTIS HC A06/MF A01 CSCL 13B

To assist groups interested in inventorying air emissions of various potentially toxic substances, EPA is preparing a series of

documents such as this to compile available information on sources and emissions of these substances. This document deals specifically with chloroform. Its intended audience includes Federal, State and local air pollution personnel and others interested in locating potential emitters of chloroform and in making gross estimates of air emissions therefrom. This document presents information on: (1) the types of sources that may emit chloroform, (2) process variations and release points that may be expected within these sources, and (3) available emissions information indicating the potential for chloroform release into the air from each operation.
GRA

N84-32936# GCA Corp., Bedford, Mass.
LOCATING AND ESTIMATING AIR EMISSIONS FROM SOURCES OF CARBON TETRACHLORIDE
Research Triangle Park, N.C. EPA Mar. 1984 128 p refs (PB84-200625; EPA-450/4-84-007BA) Avail: NTIS HC A07/MF A01 CSCL 13B

Information on sources and emissions of carbon tetrachloride is presented. Federal, State and local air pollution personnel and others interested in locating potential emitters of carbon tetrachloride will benefit from the availability of the data. Information of: (1) sources that may emit carbon tetrachloride; (2) process variations and release points that may be expected within these sources; and (3) the potential for carbon tetrachloride release into the air is provided.
GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-32937 Yale Univ., New Haven, Conn.
SYSTEMATIC JOINTING IN THE CARDIUM SANDSTONE ALONG THE BOW RIVER, ALBERTA, CANADA Ph.D. Thesis
1983 337 p
Avail: Univ. Microfilms Order No. DA8412427

Four steeply dipping joint sets are present in folded and thrusted Cretaceous Cardium sandstone beds where they crop out along the Bow River in the Rocky Mountain foothills of Alberta, Canada. All four sets are infilled by quartz and calcite. The relative ages were determined by cross cutting relations of the fillings at joint intersections. Some of the joint fillings in three of the sets show slickenside striations parallel to the trace of bedding and in two of these sets the fillings are also scored by thrust fault slickensides. Joint surface structures indicate that all four sets formed by incremental crack growth outward from near the center of the sandstone beds. The macrojoint spacing and the presence of microjoint sets suggest that each sandstone bed jointed independently in response to a common stress field. The orientation of each joint set is perpendicular to a horizontal component of a tectonic stress field that was either the maximum principal tension or least principal compression and which changed azimuthal direction with time. It is assessed that cracks propagate perpendicular to the maximum circumferential tensile stress component of the stress field in the region of the crack tip.
Dissert. Abstr.

N84-32938 Michigan Univ., Ann Arbor.
DIAGENSIS AND DEFORMATION OF THE MADISON GROUP, COLORADO AND UTAH OVERTHRUST BELT Ph.D. Thesis
Joyce Margaret Budai 1984 216 p
Avail: Univ. Microfilms Order No. DA8412110

A regional evaluation of dolomitization patterns and variations in the isotopic composition of replacive dolomite in the Mississippian Madison Group led to the conclusion that there were at least two regional episodes of early dolomitization. The earliest dolomitization event was related to hypersaline brines generated on upper Madison Group tidal flats. A second episode of mixed water dolomitization occurred during the early stages of Amsden Formation deposition. Deep burial and overthrust belt deformation of the Madison Group introduced a complex sequence of fracturing pressure solution, and carbonate vein mineralization. Deformational textual relationships in the Madison Group lead to the conclusion that fractures both modify and enhance continued pressure solution. Isotopic changes in vein mineralization together with the textual evidence to calcitization of host rock and vein dolomite suggest that pressure solution and fracturing were processes that opened the Madison Group to large scale allochthonous fluid migration during deformation. Dissert. Abstr.

N84-32939 California Univ., Santa Barbara.
STRATIGRAPHY AND SEDIMENTOLOGY OF THE UPPER PROTEROZOIC KINGSTON PEAK FORMATION, PANAMINT RANGE, EASTERN CALIFORNIA Ph.D. Thesis
Julia Mary Gertrude Miller 1983 417 p
Avail: Univ. Microfilms Order No. DA8411235

The Kingston Peak Formation was deposited under glacial conditions with contemporaneous volcanism and tectonic activity. Sedimentation in the Panamint Range was on the continental shelf and locally terrestrial. Two ice advances are recorded with associated sea level fluctuations. Striated stones and dropstones in the formation east of Death Valley support this interpretation. Data were collected during mapping of parts of the Manly Peak and Telescope Peak quadrangles; eight stratigraphic sections between Goler Wash and Wildrose Canyon were measured and sedimentologic observations were made in intervening areas and east of Death Valley. Interbedded pillow basalt demonstrates subaqueous volcanism. Overlying laminated limestone marks a transgression. Succeeding interbedded limestone, graded graywacke and siltstone double in thickness over a few kilometers demonstrates local subsidence and renewed terrigenous input. Trough cross laminated arkosic sandstone overlain by diamicite, with a locally erosive base, represent glaciofluvial deposits and lodgement till recording the second ice advance. The stratigraphy and thickness of the formation are variable across the Death Valley region and alternative correlation schemes exist. A coherent stratigraphy among ranges southeast of Death Valley supports severe Cenozoic extension, but elsewhere constraints on palinspastic reconstructions are restricted by stratigraphic variation. Deposition was in local basins with nearby source areas during incipient continental rifting.
Dissert. Abstr.

N84-32940 Washington Univ., Seattle.
THE PETROLOGY, STRUCTURE AND GEOCHEMISTRY OF AN ARCHEAN TERRANE IN THE NORTH SNOWY BLOCK, BEARTOOTH MOUNTAINS, MONTANA Ph.D. Thesis
David William Mogk 1984 479 p
Avail: Univ. Microfilms Order No. DA8412409

Six major rock units in the North Snowy Block in an Archean mobile belt are recognized between all units representing discontinuities in metamorphic grade, structural style, geochemistry, and isotopic ages. Four of the units occur in NE trending linear belts; the Basement Gneiss; the phyllitic Davis Creek Schist; the mount cowen augen gneis; the Paragneiss unit. Overlying the linear units is the 3.2 Ga old Pine Creek Nappe Complex, an isoclinally folded, middle to upper amphibolite facies, thrust nappe consisting of the Barney Creek Amphibolite, George Lake Marble and Jewel Quartzite. The highest structural units, including a thick sequence of upper amphibolite grade supracrustal rocks and a lower section of injected 3.4 Ga old granitic to tonalitic migmatitic rocks were emplaced on the Columbine Thrust. It is shown that there was secular variation in tectonic style in the Archean of southwest Montana. Three stages are recognized: (1) melting of ancient matic crust produced trondhjemitic continental nuclei; (2) numerous ensialic basins were created and destroyed, resulting in high grade metamorphism and mignatization of supracrustal rocks; and (3) contemporary style plate tectonics resulted in generation of large volumes of andesities and calc-alkaline granitic rocks, transcurrent faulting, and thrust faulting.
Dissert. Abstr.

N84-32941 Syracuse Univ., N. Y.
COMPUTER CALCULATED ANALYSIS OF SUBSURFACE FORMATION POROSITIES IN CENTRAL NEW YORK STATE Ph.D. Thesis
Vijay Singh 1983 243 p
Avail: Univ. Microfilms Order No. DA8410742

A computer oriented approach to evaluate the digital geophysical log data on a regional basis for calculating and displaying the subsurface formation porosities is presented. A data base consisting of two files was processed: the New York State Well Log file, and the New York State Oil and Gas Production and Tops file. The Well Log file consists of digital well log data obtained by digitizing the well log traces from hard copy charts. Standard gamma ray logs were used to correlate formations and to calculate shale fractions used for correcting computed porosities. Standard neutron and density logs were used to calculate formation porosities for the entire logged section of wells. Porosities were displayed as cross sections to show vertical and lateral porosity variations. Porosities are compared over a large area for regional analysis of reservoirs. The New York State Oil and Gas Production and Tops file was used to construct structure contour and isopach maps. The major porosity trends were established and the relationships of porosity to structural trends or the depositional environments of formations were suggested. The potential reservoir areas are delineated in several geologic formations in central New York State. It is suggested that computer analysis of geologic information can be applied for the major reevaluation of reservoirs anywhere in the nation. Dissert. Abstr.

N84-32942 Washington Univ., Seattle.
GEOLOGY, PETROLOGY AND GEOCHRONOLOGY OF THE METAMORPHIC ROCKS OF MEATIQ DOME, CENTRAL EASTERN DESERT, EGYPT Ph.D. Thesis
Neil Colrick Sturchio 1983 236 p
Avail: Univ. Microfilms Order No. DA8410637

Meatiq Dome is an antiformal structure exposed in a 500 sq km area in the Late Proterozoic terrane of the Central Eastern Desert of Egypt. The dome consists of a conformable sequence of metamorphic units. In ascending order, these are granite gneiss, quartzofeldpathic mylonite, quartz phyllonite, and mafic mylonite. Syntectonic intrusions of diorite tonalite granodiorite are within the units above the granite gneiss. Post tectonic granite crosscuts all other units. Foliation in the metamorphic units is low angle, and is associated with NW trending lineation, intrafolial folds have axes subparallel to lineation. The granite gneiss consists of two subunits--one (white gneiss) is marginally peralkaline and arfvedsonite bearing, and the other (pink gneiss) is metaluminous and hornblende and biotite bearing. The quartzofeldspathic mylonite is nearly identical in composition to the pink gneiss, compatible with a single granite protolith for these two units. The quartz phyllonite bears strong compositional resemblance to the pink gneiss and quartzofeldspathic mylonite, with the main exception of Na content which is very low in this unit. The chemical data suggest that the quartz phyllonite had a volcanic protolith that had undergone extensive hydrothermal alteration soon after emplacement.
Dissert. Abstr.

N84-32943 Washington Univ., Seattle.
LOWER TERTIARY BIOSTRATIGRAPHY AND PALEOECOLOGY OF THE QUILCENE-DISCOVERY BAY AREA, NORTHEAST OLYMPIC PENINSULA, WASHINGTON Ph.D. Thesis
Patrick Kevin Spencer 1984 205 p
Avail: Univ. Microfilms Order No. DA8412416

The lower Tertiary stratigraphic succession in the Quilcene-Discovery Bay region comprises an unconformity bounded sequence including five distinctive marine sedimentary rock units. These include an upper sedimentary member assigned to the Crescent Formation, the Aldwell Formation, the Lyre Formation, including a lower conglomerate and an upper turbidite member, the Snow Creek, and the Townsend Shale. The sedimentary member of the Crescent Formation and the Aldwell Formation were deposited as a result of erosion of basaltic topographic highs. The Lyre Formation conglomerate member was deposited as a coarse grained debris flow. The overlying Snow Creek member was deposited by turbidity currents on the same submarine fan system. The Townsend Shale represents a starved basin deposit resulting from cut off of coarse clastic sediments at the source area. Paleoecologic analyses indicates that deposition took place in cold marine waters at depths in the bathyal zone. An exception to this is seen in the fauna of the sedimentary member of the Crescent Formation. Dissert. Abstr.

N84-32944 Oregon State Univ., Corvallis.
PALEOMAGNETISM, ROCK MAGNETISM AND DIAGENESIS IN HEMIPELAGIC SEDIMENTS FROM THE NORTHEAST PACIFIC OCEAN AND THE GULF OF CALIFORNIA Ph.D. Thesis
Robert Karlin 1984 261 p
Avail: Univ. Microfilms Order No. DA8411469

Downcore magnetic profiles from undisturbed Kasten cores taken in rapidly deposited laminated sediments from the Gulf of California and in bioturbated hemipelagic muds on the Oregon continental slope give apparently reliable directions, but show dramatic decreases in the intensities of natural (NRM) and artificial (ARM, IRM) remanences with depth. Downcore porewater and solid sulfur analyses show concave down decreases in porewater sulfate and systematic increases in pyrite and metastable monosulfides. The maximum curvature of the sulfide profiles occurs directly below the high magnetization zone. Combined with other compositional and mineralogic analyses, these data suggest that due to oxidative decomposition of organic matter, magnetites and other iron oxides become progressively reduced and subsequently sulfidized and pyritized with depth. Iron reduction seems to occur prior to sulfide formation. Changes in magnetic stability parameters are consistent with selective dissolution of the finer sized grains causing downcore coarsening of the magnetic fraction.
Dissert. Abstr.

N84-32945 Wisconsin Univ., Madison.
PETROGRAPHY AND ULTRASONIC WAVE VELOCITY IN THE ADMIRE FORMATION (PERMIAN), KANSAS Ph.D. Thesis
Esu Obukt.ɔ Esu 1984 163 p
Avail: Univ. Microfilms Order No. DA8405421

Petrographic analysis and elastic wave velocity measurements on sandstone cores from producing wells in the Admire Formation were done to discriminate among dirty sandstone facies from different sedimentary facies and to identify similar lithofacies from well to well. The influence of sandstone compositional vaiables on measured velocity was also studied. X-ray diffraction techniques and the scanning electron microscope (SEM) were employed to assist in the petrographic interpretations of measured velocities. Results show that a close correspondence exists between measured velocity and the petrographic variables in the sandstone facies, compressional wave velocity is inversely related to both porosity and the labile fragments. Porosity has a great control on velocities and laboratory velocity measurements along with petrography and in situ well logs are accurate enough for the identification of similar lithofacies between wells. Dissert. Abstr.

N84-32946 Stanford Univ., Calif.
CYCLOTRON RESONANT SCATTERING OF ENERGETIC ELECTRONS BY ELECTROMAGNETIC WAVES IN THE MAGNETOSPHERE Ph.D. Thesis
Hung-Chun Chang 1984 116 p
Avail: Univ. Microfilms Order No. DA8408263

The cyclotron resonance interaction between coherent VLF waves and radiation belt electrons in the Earth's magnetosphere is considered. One consequence of such interactions is the precipitation of these electrons into the ionosphere. A test particle simulation method is employed to study the wave induced perturbations of electron trajectories. To include the quasirelativistic electron energies up to at least hundreds of keV, equations of motion for the cyclotron resonance wave particle interaction are rewritten taking into account relativistic effects. A computer model is developed for determining the transient evolution of the energy flux into the ionosphere of electrons precipitated due to interactions with VLF wave packets propagating longitudinally along the

geomagnetic field lines. The transient precipitation model is applied to the cases of variable frequency VLF signals, such as whistlers, chorus emissions, and triggered emissions. Results demonstrate that it is possible to use this model to interpret the observed experimental results and to diagnose some features of the energetic electron distributions in the magnetosphere. Dissert. Abstr.

N84-32947 Florida State Univ., Tallahassee.
TWO-DIMENSIONAL FINITE AMPLITUDE MOUNTAIN WAVES IN THE PRESENCE OF MOISTURE Ph.D. Thesis
Juan Carlos Jusem 1984 122 p
Avail: Univ. Microfilms Order No. DA8412504

A two-dimensional, nonlinear, time-dependent, non-hydrostatic, anelastic, numerical model is used to assess the effect of condensation on the evolution and structure of gravity waves generated by the passage of a stable, moist stream over topography. Precipitation is ignored but water phase changes are taken into account explicity. The numerical approach uses centered finite differences, except for liquid water, which is advected by using an upwind scheme. A constant basic wind and a constant stability are assumed in order to isolate the effects of moisture. Evolution for hydrostatic and non-hydrostatic flows are studied. A breaking wave case is also studied. The presence of condensation delays the overturing of isentropes and the formation of the critical layer that accompanies wave-breaking. Dissert. Abstr.

N84-32948*# California Inst. of Tech., Pasadena. Div. of Geological and Planetary Science.
SCIENCE SUPPORT FOR THE EARTH RADIATION BUDGET SENSOR ON THE NIMBUS-7 SPACECRAFT Final Technical Report, Feb. 1976 - Sep. 1982
Andrew P. Ingersoll Sep. 1982 30 p refs
(Contract NAS5-22965)
(NASA-CR-175251; NAS 1.26:175251) Avail: NTIS HC A03/MF A01 CSCL 04A

Experimental data supporting the Earth radiation budget sensor on the Nimbus 7 Satellite is given. The data deals with the empirical relations between radiative flux, cloudiness, and other meteorological parameters; response of a zonal climate ice sheet model to the orbital perturbations during the quaternary ice ages; and a simple parameterization for ice sheet ablation rate. E.R.

N84-32949*# Honeywell, Inc., Minneapolis, Minn. Solid State Electronics Div.
RESEARCH PRESSURE INSTRUMENTATION FOR NASA SPACE SHUTTLE MAIN ENGINE, MODIFICATION NO. 5 Monthly Progress Report
P. J. Anderson, P. Nussbaum, and G. Gustafson Jun. 1984 10 p
(NASA-CR-171128; NAS 1.26:171128; MPR-9) Avail: NTIS HC A02/MF A01 CSCL 04A

The objective of the research project described is to define and demonstrate methods to advance the state of the art of pressure sensors for the space shuttle main engine (SSME). Silicon piezoresistive technology was utilized in completing tasks: generation and testing of three transducer design concepts for solid state applications; silicon resistor characterization at cryogenic temperatures; experimental chip mounting characterization; frequency response optimization and prototype design and fabrication. Excellent silicon sensor performance was demonstrated at liquid nitrogen temperature. A silicon resistor ion implant dose was customized for SSME temperature requirements. A basic acoustic modeling software program was developed as a design tool to evaluate frequency response characteristics. S.B.

N84-32950*# Chicago Univ., Ill. Dept. of Geophysical Sciences.
OPTIMAL MEASUREMENT OF ICE-SHEET DEFORMATION FROM SURFACE-MARKER ARRAYS
D. R. MacAyeal [1983] 27 p refs
(Grant NAG5-394)
(NASA-CR-173877; NAS 1.26:173877) Avail: NTIS HC A03/MF A01 CSCL 08L

Surface strain rate is best observed by fitting a strain-rate ellipsoid to the measured movement of a stake network or other collection of surface features, using a least squares procedure. Error of the resulting fit varies as 1/(L delta t square root of N), where L is the stake separation, delta is the time period between initial and final stake survey, and n is the number of stakes in the network. This relation suggests that if n is sufficiently high, the traditional practice of revisiting stake-network sites on successive field seasons may be replaced by a less costly single year operation. A demonstration using Ross Ice Shelf data shows that reasonably accurate measurements are obtained from 12 stakes after only 4 days of deformation. It is possible for the least squares procedure to aid airborne photogrammetric surveys because reducing the time interval between survey and re-survey permits better surface feature recognition. Author

N84-32951*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MEASUREMENT OF H2O AND OTHER TRACE GASES IN THE STRATOSPHERE USING A HIGH RESOLUTION FAR-INFRARED SPECTROMETER AT 28 km Semiannual Status Report, 1 Jan. - 30 Jun. 1984
Wesley A. Traub and Kelly V. Chance Sep. 1984 34 p refs
(Grant NsG-5175)
(NASA-CR-173879; NAS 1.26:173879; SASR-14) Avail: NTIS HC A03/MF A01 CSCL 04A

Data analysis results from the 1983 BIC 1 and 2 balloon flights are presented, with emphasis on H2O2, OH, HCL, O3, O2, and H2O. A 2 sigma limit on H2O2 abundance was set, as a function of altitude. This is comparable to or less than the theoretically predicted winter abundances from the 2-D models of Dupont, with a large enough summer maximum to facilitate concentration profile measurements. There is a definite drop in OH concentration from day to night following two model profiles. There was general agreement between HF measurements. The dominant role of the far wings of H2O lines in low altitude spectra was recognized. The strength of these wings exceeds that of many molecular line cores, including O3 and O2, especially near the long wavelength end of the spectra (100 cm (-1)). Newly measured positions for O3 and H2O were obtained. S.B.

N84-32952*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCEEDINGS OF A WORKSHOP ON POLAR STRATOSPHERIC CLOUDS: THEIR ROLE IN ATMOSPHERIC PROCESSES
Patrick Hamill, ed. (San Jose State Univ., Calif.) and Leonard R. McMaster, ed. Sep. 1984 80 p refs Proc. held in Virginia Beach, Va., 20-22 Jun. 1983
(NASA-CP-2318; L-15809; NAS 1.55:2318) Avail: NTIS HC A05/MF A01 CSCL 04A

The potential role of polar stratospheric clouds in atmospheric processes was assessed. The observations of polar stratospheric clouds with the Nimbus 7 SAM II satellite experiment were reviewed and a preliminary analysis of their formation, impact on other remote sensing experiments, and potential impact on climate were presented. The potential effect of polar stratospheric clouds on climate, radiation balance, atmospheric dynamics, stratospheric chemistry and water vapor budget, and cloud microphysics was assessed. Conclusions and recommendations, a synopsis of materials and complementary material to support those conclusions and recommendations are presented. E.A.K.

N84-32953# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOLAR TIDES IN THE MESOSPHERIC SODIUM LAYER Ph.D. Thesis [MARES SOLARES NA CAMADA MESOSFERICA DE SODIO]
Paulo Prado Batista Oct. 1983 180 p refs In PORTUGUESE; ENGLISH summary
(INPE-2942-TDL/151) Avail: NTIS HC A09/MF A01

Atmospheric tides in the mesopause region based on 24 hour measurements of sodium density with a laser radar are discussed.

The average variation of the layer during 24 hours displays strong oscillations with 12 and 24 hour periods. Oscillations are separated into diurnal and semidiurnal components and the results are interpreted by a theory of atmospheric wave propagation for minor constituent layers. It is shown that the vertical wind is important because of its effects on sodium density measured at a fixed height. The wind over a limited height range is determined. The 24 hour component shows characteristics of an evanescent mode in disagreement with tidal theory. The 24 hour component shows vertical phase propagation with a wavelength of minus 50 km, which agrees with recent theories, but the relative amplitude of this component is greater than expected. E.A.K.

N84-32954# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
A DETERMINATION OF THE CHARGE STATE OF ENERGETIC MAGNETOSPHERIC IONS BY THE OBSERVATION OF DRIFT ECHOES
J. B. Blake, J. F. Fennell, D. N. Baker (Los Alamos Scientific Lab., N. Mex.), R. D. Belian, and P. R. Higbie (Los Alamos Scientific Lab., N. Mex.) 15 Jun. 1984 23 p Sponsored in part by DOE
(Contract F04701-83-C-0084)
(AD-A143181; TR-0084(4940-05)-2; SD-TR-84-16) Avail: NTIS HC A02/MF A01 CSCL 04/1

The mean charge states of heavy ions trapped in the Earth's magnetosphere are important parameters for distinguishing among magnetospheric theories. No direct measurements have been made at energies greater than approximately 50 keV. A technique that uses the E/q dependence of ion drift velocity is described in this report. To illustrate the application of this technique, a drift-echo event that followed a substorm occurring at 2100-2200 UT on 25 February 1979 is discussed. In this event the charge state of helium ions was +2 and that of CNO ions was > +2 and probably > or = +5. This result implies that the drift-echo particles were freshly injected solar-wind plasma. Author (GRA)

N84-32955# Washington Univ., Seattle.
WAVE PROPAGATION IN DENSE GEOPHYSICAL MEDIA Final Report, 1 Apr. 1981 - 31 Mar. 1984
Akira Ishimaru 12 Jun. 1984 8 p
(Contract DAAG29-81-K-0065)
(AD-A143213; ARO-17746.1-GS) Avail: NTIS HC A02/MF A01 CSCL 08/7

This final report summarizes our study of the interactions between the wave characteristics and the dense geophysical media. We have clarified the propagation constant of the coherent wave in a dense medium, conducted a pulse-broadening study, observed an interesting backscattering phenomenon, and investigated vector radiative transfer theory. GRA

N84-32956# Photometrics, Inc., Woburn, Mass.
TURBULENT DIFFUSION, DISSIPATION, AND WINDS FROM CALIBRATED PHOTOGRAPHS OF ARTIFICIAL CLOUDS Final Report, 16 Apr. 1982 - 30 Sep. 1983
Christian A. Trowbridge 31 Oct. 1983 33 p
(Contract F19628-82-C-0087)
(AD-A143231; PhM-TR-84-03; AFGL-TR-84-0087) Avail: NTIS HC A03/MF A01 CSCL 04/1

Radiometrically and photogrammetrically calibrated photographic images of tracer material released into the upper atmosphere were microdensitometrically reduced. The digital optical density data were computer analyzed by Fourier-transform and configuration space techniques to determine turbulent diffusion coefficients and heating rates, and other parameters describing upper atmosphere turbulence. Turbulent release altitudes were determined by photogrammetric triangulation and by an inverse triangulation method using previously determined wind profiles. Examination of the long term variation of turbopause height suggests that the altitude of the turbopause is a function of the 10.7 cm solar flux. Author (GRA)

N84-32957# Photometrics, Inc., Woburn, Mass.
EXPERIMENTS ON INTERACTION OF keV PARTICLE BEAMS WITH THE IONOSPHERE Final Report, 1 Aug. 1980 - 31 Jul. 1983
I. L. Kofsky, D. P. Villanucci, J. L. Barrett, M. T. Chamberlain, and R. B. Sluder 31 Aug. 1983 138 p
(Contract F19628-80-C-0133)
(AD-A143277; PHM-TR-83-01; AFGL-TR-83-0316) Avail: NTIS HC A07/MF A01 CSCL 04/1

The purpose of the program reported here is to study the interaction of beams of energetic (several keV's) electrons and ions with the upper atmosphere by optical sensing from onboard the rocket from which they are injected. Particle trajectories, return current paths, development of plasma sheaths, and other collective (beam-plasma) interactions that result in instabilities and discharge phenomena in the vehicle's vicinity are considered. The photometric and imaging instruments complement those making direct in situ measurements of particle densities and energy distributions, rocket potential, and spectrums of electromagnetic radiation in the charge-injection experiments. GRA

N84-32958# Air Force Geophysics Lab., Hanscom AFB, Mass.
A GERDIEN CONDENSER SYSTEM FOR MEASURING STRATOSPHERIC CHARGED PARTICLE DENSITIES Instrumentation Papers, Oct. 1979 - Oct. 1983
C. Sherman, A. D. Bailey, and J. Borghetti 3 Feb. 1984 29 p
(AF Proj. 6687)
(AD-A143317; AFGL-TR-84-0046; AFGL-IP-322) Avail: NTIS HC A03/MF A01 CSCL 04/1

A Gerdien condenser system for measuring stratospheric charged particles densities is described. The system makes use of commercially available blowers to obtain the bulk gas flow through the condenser and a time of charge method for measuring collected currents. System modifications made over several balloon flights are described and the results of one flight are presented in some detail. Author (GRA)

N84-32959# Air Force Geophysics Lab., Hanscom AFB, Mass.
COMPOSITION ALTERATION OF STRATOSPHERIC AIR DUE TO SAMPLING THROUGH A FLOW TUBE: ENVIRONMENTAL RESEARCH PAPERS
J. M. Calo 3 Feb. 1984 43 p
(AF Proj. 4643)
(AD-A143319; AFGL-TR-84-0045; AFGL-ERP-869) Avail: NTIS HC A03/MF A01 CSCL 04/1

A numerical model of a sampling tube used to conduct stratospheric air to the sampling point of a balloon-borne cryogenic whole air sampler, was developed to assess the potential effects of passage through the tube on alteration of species mixing ratios from those in the ambient. This model is based on the application of a general purpose, multireaction chemical kinetics code (CHEMSEN) to a 31 reaction (49 with heterogeneous wall loss), 23 species (41 with adsorbed or lost constituents) stratospheric kinetic model, modified to take into account heterogeneous interactions with the tube wall. Effects of homogeneous gas phase chemistry and heterogeneous wall loss were estimated at three different altitudes: 15, 20, and 30 km. It was found that the gas phase chemistry was generally incapable of appreciably altering the sampled composition from that in the ambient. On the other hand, depending on the particular set of assumptions used, heterogeneous wall loss was found capable of imposing significant alterations on the sampled gas composition, particularly at altitudes above about 20 km, due to rapid radial diffusion. The expected tube wall temperature is shown to have a negligible effect on the homogeneous gas phase kinetics in the sampling tube. GRA

N84-32960# Air Force Geophysics Lab., Hanscom AFB, Mass.
SEISMIC HAZARD STUDY FOR SELECTED SITES IN NEW MEXICO AND NEVADA Final Report, 1 Oct. 1981 - 30 Sep. 1983
J. C. Johnston 27 Dec. 1983 57 p
(AF Proj. 7600)
(AD-A143392; AD-E400961; AFGL-TR-84-0005; AFGL-ERP-865)
Avail: NTIS HC A04/MF A01 CSCL 08/11

Seismic hazard evaluations were conducted for specific sites

in New Mexico and Nevada. For New Mexico, a model of seismicity was developed from historical accounts of medium to large shocks and the current microactivity record from local networks. Ninety percent confidence levels at Albuquerque and Roswell were computed to be 56 gals for a 10-year period and 77 gals for a 20-year period. Values of ground motion for Clovis were below these values. Peak velocity and displacement were also computed for each site. Deterministic spectra based on the estimated maximum credible earthquake for the zones which the sites occupy were also computed. For the sites in Nevada, the regionalizations used in Battis (1982) for the uniform seismicity model were slightly modified. For 10- and 20-year time periods, peak acceleration values for Indian Springs were computed to be 94 gals and 123 gals and for Hawthorne 206 gals and 268 gals. Deterministic spectra were also computed. The input parameters were well determined for the analysis for the Nevada sites because of the abundance of data. The values computed for New Mexico, however, are likely upper limits. As more data are collected from the area of the Rio Grande rift zone, the pattern of seismicity will become better understood. At this time a more detailed, and thus more accurate, model may emerge. GRA

N84-32961# Teledyne Geotechnical, Garland, Tex.
DEVELOPMENT OF THE MODEL 52500 STRAIN-INERTIAL SEISMOMETER SYSTEM (PROTOTYPE) Technical Report, 15 Apr. 1980 - 30 Sep. 1983
15 May 1984 65 p
(Contract F08606-80-C-0014; ARPA Order 2897)
(AD-A143572; TR-83-9) Avail: NTIS HC A04/MF A01 CSCL 08/11

Two prototype strain-inertial seismometer systems were designed and built to investigate the use of linear combinations of collocated strain and inertial data for providing enhanced seismic signal-to-noise ratios. These instruments have undergone initial laboratory testing and preliminary field evaluation. The preliminary evaluation data indicate: (1) An improved signal-to-noise ratio can be achieved by using linear combinations of the strain and inertial data, the major improvement occurring in the frequency range of the cultural microseisms (3 to 5 Hz). (2) A reduction in the instrument noise level of the strain output of the seismometer will be required prior to final evaluation. Author (GRA)

N84-32962# Argonne National Lab., Ill. Geoscience and Engineering Group.
CRYSTALLINE ROCKS OF THE NORTHEASTERN UNITED STATES
W. Harrison, M. Flower (Illinois Univ., Chicago), M. Sood (Northeastern Illinois Univ.), M. Tisue, and D. Edgar Oct. 1983 432 p refs
(Contract W-31-109-eng-38)
(DE84-013673; ANL/ES-137-Pt-1) Avail: NTIS HC A19/MF A01

Exposed crystalline rocks in Maine, New Hampshire, Vermont, northeastern New York (Adirondack Mountains), Massachusetts, Rhode Island, Connecticut, southeastern New York, northern New Jersey, and southeastern Pennsylvania are discussed. Crystalline rocks are defined as bodies of medium and coarse grained igneous and high grade metamorphic rocks. Background information to assist in evaluating the geologic suitability of such rocks for isolating high level radioactive waste is presented information which describes the size, shape, and location; relative and absolute age; origin; petrography; secondary intrusions; country rock; structure; and geophysical characteristics is presented for each crystalline rock body in the study region that has an area of at least 78 l:m(2) (30 mi(2)). DOE

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-32963 Wisconsin Univ., Madison.
THE CLIMATIC IMPACT OF VOLCANIC ACTIVITY Ph.D. Thesis
Brian Merritt Goodman 1984 264 p
Avail: Univ. Microfilms Order No. DA8405424

The influence of both large and moderate magmatic eruptions upon the mean annual Northern Hemisphere stratrospheric aerosol optical depths (NHSOD) and surface temperature anomalies (NHSTA) during the past 100 years were assessed. The observed NHSOD estimates were derived from a homogeneous analysis of pyrheliometric measurements from 48 stations. Time profiles of volcanic enhancements to the stratospheric aerosol load can be described as a convolution of a constant gas-to-particle conversion rate and a seasonally varying removal rate. The resulting time profiles when applied to a chronology of past magmatic eruptions explained 87% of the observed NHSOD variance. Large magmatic eruptions explained 54% of the observed NHSOD variance. A cross spectral analysis was used to empirically describe the systematic frequency dependence of the lagged NHSTA response to volcanic NHSOD modulations. Dissert. Abstr.

N84-32964 Wisconsin Univ., Madison.
DYNAMICAL SIMULATION OF CLOUDY BOUNDARY LAYER FLOW DURING COLD AIR OUTBREAKS Ph.D. Thesis
Chiu-Wai Yuen 1983 241 p
Avail: Univ. Microfilms Order No. DA8400526

A two dimensional primitive equation planetary boundary layer model is constructed and applied to simulate downwind evolution of coupled dynamical, thermodynamical and cloud properties in the planetary boundary layer (PBL) developed during cold air outbreaks over warm ocean. A layered parametric approach is adopted to model the inversion capped convective boundary layer filled with shallow cumuli, or topped by stratocumulus or cloud free air. A one dimensional version of the model is first applied to a local simulation of trade wind flow. Vertical distributions of momentum flux and wind in the cumulus-filled baroclinic PBL are realistically simulated compared to observations, confirming the validity of the momentum flux parameterization scheme assembled in this research. Comparative numerical experiments for moderate intensity air sea interaction illustrate the importance of nonprecipitating cumulus convection and large scale environmental conditions. Boundary layer flow is influenced by the basic geostrophic wind distribution and the PBL depth is also sensitive to large scale vertical velocity. Dissert. Abstr.

N84-32965*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
DYNAMIC MODEL OF THE EARTH'S UPPER ATMOSPHERE Final Report, 27 Aug. 1982 - 26 Feb. 1984
Jack W. Slowey Washington NASA Sep. 1984 22 p refs
(Contract NAS8-34947)
(NASA-CR-3835; NAS 1.26:3835) Avail: NTIS HC A02/MF A01 CSCL 04B

An initial modification to the MSF/J70 Thermospheric Model, in which the variations due to sudden geomagnetic disturbances upon the Earth's upper atmospheric density structure were modeled is presented. This dynamic model of the geomagnetic variation included is an improved version of one which SAO developed from the analysis of the ESRO 4 mass spectrometer data that was incorporated in the Jacchia 1977 model. The variation with geomagnetic local time as well as with geomagnetic latitude are included, and also the effects due to disturbance of the temperature profiles in the region of energy deposition. Author

N84-32966# Committee on Science and Technology (U. S. House).
AGRICULTURE WEATHER SERVICES
Washington GPO 1984 118 p Hearing before the Subcomm. on Nat. Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., No. 66, 31 Mar. 1983
(GPO-27-913) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

The importance of agriculture weather services is discussed with emphasis on cost effectiveness, computer based weather forecasting, and the impact of the service on the citrus industry in Florida. A discussion on whether the National Weather Service or

the private sector is better equipped to provide agriculture weather services is also included. M.A.C.

N84-32967# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE SEVERITY OF THE BRAZILIAN FREEZE OF 1981 AS MONITORED IN REAL TIME BY SATELLITE
Michael Allan Fortune Nov. 1982 13 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazilian Congr. on Meteorology, Pelota, Brazil, 1982
(INPE-2586-PRE/234) Avail: NTIS HC A02/MF A01

The freeze of 20-21 July 1981 destroyed most of the coffee harvest in 3 states of Brazil. With SMS/GOES satellite images it was possible to locate and monitor the areas of severest cold in real time on television displays. The ground temperature field seen on the enhanced infrared images was compared with station observations. The images presented here document the widespread occurence of subzero temperatures in the states of Minas Gerais, Mato Grosso do Sul and Sao Paulo. The freeze struck particularly hard north of the Tropic of Capricon, where such events are rare; thus the losses to agriculture were substantial. Author

N84-32968# Committee on Science and Technology (U. S. House).
HURRICANE ALICIA: PREDICTION, DAMAGE AND RECOVERY EFFORTS
Washington GPO 1984 299 p Hearings before the Subcomm. on Natural Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol. and the Subcomm. on Water Resources of the Comm. on Publ. Works and Transportation, 98th Congr., 1st Sess., no. 81, 23, 24 Sep. 1983
(GPO-33-446) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

Subcommittee hearings are presented on Hurricane Alicia including its prediction, damage, and recovery efforts. The functions of the National Weather Service (NWS) are described, particularly as relating to Hurricane Alicia. Some functions discussed are: the effectiveness of the NWS in predicting hurricanes, its hurricane rating system, use of NWS services by localities and issuance of severe weather warnings. Damage factors such as preparedness, responsiveness of federal agencies, debris clearance problems and other recovery efforts are also covered. E.R.

N84-32969# Weapons Systems Research Lab., Adelaide (Australia).
INVESTIGATION INTO THE INTERNAL AERODYNAMIC DESIGN AND ASSOCIATED ERRORS IN A FAST DESCENT DUCTED SONDE FOR THE MEASUREMENT OF ATMOSPHERIC PRESSURE AND TEMPERATURE (AMPARS PHASE 2)
P. H. O. Pearson Nov. 1983 28 p
(AD-A143189; WSRL-0343-TR) Avail: NTIS HC A03/MF A01 CSCL 04/2

This report investigates aspects of the atmospheric pressure and temperature measuring technique for a fast descent sonde. The sonde, which is drogue stabilized, is released from a rocket vehicle in the vicinity of the apogee which is 20 km. Low speed wind tunnel tests have been conducted to check any errors in the measurement of atmospheric pressure resulting from the positioning of the static tube mounted inside an internally ducted sonde. It shows that no errors occur for the chosen position up to an external airflow incidence of 30 deg. Errors owing to heat transfer into a centrally mounted thermistor are examined for various thermistor positions and incidence angles and the thermistor response time has been measured and compared with theoretical results. Overall it is shown that the duct design is suitable for a fast descent sonde with errors well below those specified by the Bureau of Meteorology for standard ascending meteorological sondes. Author (GRA)

N84-32970# Naval Postgraduate School, Monterey, Calif.
USE OF THE TENSOR PRODUCT FOR NUMERICAL WEATHER PREDICTION BY THE FINITE ELEMENT METHOD, PART 1 Final Report, Oct. 1982 - Sep. 1983
R. E. Newton Apr. 1984 20 p
(AD-A143273; NPS69-84-001) Avail: NTIS HC A02/MF A01 CSCL 04/2

This report concerns app cation of the tensor product in solving large sets of linear equations arising in Numerical Weather Prediction problems. The coefficient matrix considered is called the mass matrix in finite element parlance. Theory of the tensor product resolution is presented, along with methods for imposing Dirichlet and cyclic boundary conditions. Operation counts and storage requirements are compared with corresponding numbers for some widely-used solution algorithms. Listings of Fortran programs for implementing the tensor product solution system (TENSOR) and testing it are given. GRA

N84-32971# Air Force Geophysics Lab., Hanscom AFB, Mass.
EXPERIMENTS IN OBJECTIVE AVIATION WEATHER FORECASTING USING UPPER-LEVEL STEERING Final Report, 1 Oct. 1981 - 30 Sep. 1983
H. S. Muench 13 Dec. 1983 47 p
(AF Proj. 667-0)
(AD-A143393; AD-E400961; AFGL-TR-83-0328; AFGL-ERP-863) Avail: NTIS HC A03/MF A01 CSCL 04/2

This report describes a series of three experiments designed to test the feasibility of using upper-level steering of weather patterns to produce short-range local forecasts. Objective forecast models were developed and tested using fall and winter data from northeastern United States. The complexity of the models was increased in attempts to treat problems related to coexistence of stationary and traveling patterns and the effects of diurnal changes in the boundary layer. The first model simply steers (or advects) aviation weather parameters analyzed on an x-y grid by looking upstream at 1-hour time steps. The model was tested during a 3-week period using the AFGL McIDAS facility, preparing 0-15 hour forecasts of wind, cloud cover, visibility, and dewpoint at three locations. Two steering flows used were the 700-mb wind field and the vertically integrated 850- to 300-mb wind field. In general, the root-mean-square (rms) errors were worse than persistence for 0-9 hours. Because errors were introduced when stationary (orographic) patterns were advected together with traveling systems, the forecast model was revised to advect the change-with-time fields. This model was tested on 12 winter cases. Scores for vector wind, cloud amount, and temperature were slightly better than both persistence and model-output-statistics (MOS) at 0-3 hours, but were worse at longer periods. One difficulty was that the diurnal changes reversed sign several hours into the forecast. A third model was developed that treats the diurnal changes separately. This model was tested on 12 days in March, producing forecasts of wind, cloud cover, visibility, temperature, and dewpoint at 12 stations. GRA

N84-32972# Naval Research Lab., Washington, D. C.
AEROSOL MEASUREMENTS AT AN OPTICAL PROPAGATION SITE ON THE OUTER HEBRIDES Interim Report, Oct. 1978 - Sep. 1979
G. L. Trusty and T. H. Cosden 31 May 1984 52 p
(AD-A143564; NRL-8800) Avail: NTIS HC A04/MF A01 CSCL 04/2

Measurements of aerosol particle-size distributions and meteorological parameters at a land-based optical propagation site in the Outer Hebrides are compared with identical measurements in the open sea and on San Nicolas Island, California. Calculated extinctions due to aerosols are also compared. A brief discussion of the logistics of operating at the site is included. Author (GRA)

N84-32973# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
CLIMATE PREDICTION. PART 1: CYCLONE FREQUENCY
B. P. Hayden Jul. 1984 135 p
(Contract N00014-81-K-0033)
(AD-A143576; TR-30-Pt-1) Avail: NTIS HC A07/MF A01 CSCL 04/2

Climate prediction models based on multivariate analyses of cyclone frequencies are constructed from historical data (1885-1960) and evaluated for forecast skill on independent data

(1960-1983). Cyclone frequencies are predicted for six-month duration seasons at 87 locations over eastern North America and the western North Atlantic from 27.5 deg to 55 deg. Three types of principal components models are constructed and tested. Model 1 uses unrotated principal component axes; Model 2 uses rigid rotation of the component axes; and, Model 3 uses oblique rotations of the component axes. Forecast skill averages 75% correct for 2 category measure of forecasts. GRA

N84-32974# Pacific Northwest Lab., Richland, Wash.
WIND SHEAR FOR LARGE WIND TURBINE GENERATORS AT SELECTED TAIL TOWER SITES
D. L. Elliott Apr. 1984 81 p refs
(Contract DE84-011790)
(DE84-011790; PNL-4895) Avail: NTIS HC A05/MF A01

The nature of wind shear profiles and their variability over the height of large horizontal axis wind turbines and information on wind shear relevant to the design and operation of large wind turbines is provided. Wind turbine fatigue life and power quality are related through the forcing functions on the blade to the shapes of the wind shear profiles and their fluctuations over the disk of rotation. DOE

N84-32975# California Univ., Livermore. Lawrence Livermore Lab.
EXPERIMENTAL AND MODEL TRANSPORT AND DIFFUSION STUDIES IN COMPLEX TERRAIN WITH EMPHASIS ON TRACER STUDIES
M. H. Dickerson, K. T. Foster, and P. H. Gudiksen Feb. 1984 18 p refs Presented at OHOLO Conf. on Boundary Layer Struct., Zichron Yaacov, Israel, 25 Mar. 1984
(Contract W-7405-eng-48)
(DE84-013076; UCRL-90053; CONF-8403119-2) Avail: NTIS HC A02/MF A01

The development of better physical understanding of atmospheric boundary layer flows in areas of complex terrain are studied. Atmospheric boundary layer phenomena associated with the development, continuation and breakup of nocturnal drainage wind flows were investigated. The general objectives the program addressed during the past several years and discussed results from a major field experiment conducted in 1980 in the Geysers area of northern California are reported. Results from measurements of simultaneous tracer releases are compared to calculations from a mass consistent wind field model coupled to a particle in cell transport and diffusion model. Large variabilities exist between measurements made by samplers located one or two (DELTA)x apart when compared to the resolution of the models. Space and time averaging improves the comparisons although the design of the field experiment does not allow the determination of optimum spacial and temporal averages. DOE

N84-32976# Pacific Northwest Lab., Richland, Wash.
BASIC PRINCIPLES AND RECENT OBSERVATIONS OF ROTATIONALLY SAMPLED WIND
J. R. Connell May 1984 16 p Presented at the NASA/DOE Wind Turbine Technol. Workshop, Cleveland, 8-10 May 1984
(Contract DE-AC06-76RL-01830)
(DE84-013267; PNL-SA-12244; CONF-8405153-3) Avail: NTIS HC A02/MF A01

The concept of rotationally sampled wind speed is described. The unusual wind characteristics that result from rotationally sampling the wind are shown first for early measurements made using a 8-point ring of anemometers on a vertical plane array of meteorological towers. Quantitative characterization of the rotationally sampled wind is made in terms of the power spectral density function of the wind speed. Verification of the importance of the new concept is demonstrated with spectral analyses of the response of the MOC-0A blade flapwise root bending moment and the corresponding rotational analysis of the wind measured immediately upwind of the MOD-0A using a 12-point ring of anemometers on a 7-tower vertical plane array. The Pacific Northwest Laboratory (PNL) theory of the rotationally sampled wind speed power spectral density function is tested successfully against the wind spectrum measured at the MOD-0A vertical plane array. A single-tower empirical model of the rationally sampled wind speed is also successfully tested against the measurements from the full vertical plane array. Rotational measurements of a the wind velocity with hotfilm anemometers attached to rotating blades are shown to be accurate and practical for research on winds at the blades of wind turbines. DOE

N84-32977# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.
STUDIES IN CLIMATE
Harry vanLoon, ed. Feb. 1984 391 p refs
(PB84-196385; NCAR/TN-227) Avail: NTIS HC A17/MF A01 CSCL 04B

The analysis and modeling of climate on large spatial scales is examined through a series of presentations. The participants reviewed work of the last few years, and in addition staff members at National Center for Atmospheric Research NCAR demonstrated some capabilities of the Community Climate Model and reported on some of the observed data sets available at NCAR. GRA

N84-32978# National Oceanic and Atmospheric Administration, Washington, D. C.
MARINERS WEATHER LOG, VOLUME 28, NUMBER 2, APRIL-MAY-JUNE 1984
1984 73 p
(PB84-204569; NOAA-84061107) Avail: NTIS HC A04/MF A01 CSCL 04B

Weather observations for marine areas are described. Tropical cyclones in the North Pacific; or El Nino - Southern Oscillation Episode of 1982 - 1983; or the marine observation program and weather reviews are discussed. Author (GRA)

N84-32979# Entropy Ltd., Lincoln, Mass.
SEASONAL PRECIPITATION FORECASTING WITH A 6 TO 7 MONTH LEAD TIME IN THE PACIFIC NORTHWEST USING AN INFORMATION THEORETIC MODEL Final Report
R. A. Christensen and R. F. Elbert Mar. 1984 51 p refs
(Grant NA83AA-D-0016)
(PB84-207018; EL-RN-207; NOAA-84061401) Avail: NTIS HC A04/MF A01 CSCL 04B

An entropy minimax analysis to forecast seasonal precipitation with a 6-7 month lead time was performed for two regions in the Pacific Northwest. A model to forecast winter precipitation in the Willamette Valley, Oregon was developed using the 92 year period 1854-1945 for model building. Predictions made for the reserved test years 1946-1982 were found to have a 74% accuracy. Statistical tests established a 99% confidence that this success is not due to chance. Models to forecast winter and spring precipitation in eastern Washington were developed using the 73 year period 1873-1945. The winter model was found to have 69% predictive accuracy on the test years, with a 97% confidence against chance. The spring model was found to have an accuracy of 54%, which is statistically indistinguishable from chance. The accuracies of the winter models for both western Oregon and eastern Washington show fair uniformity throughout the 37 year test period, with a slight downward trend in the later portion. Author (GRA)

N84-32980# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.
URBAN SCALE VARIATIONS OF TURBULENCE PARAMETERS AND FLUXES
J. K. S. Ching, J. M. Godowitch, J. F. Clarke, and H. Auer (Wyoming Univ.) Jun. 1984 51 p refs
(PB84-209113; EPA-600/D-84-166) Avail: NTIS HC A04/MF A01 CSCL 04B

Sensible, (H), and latent, (LE), heat fluxes and turbulence statistics in St. Louis, Missouri and the surrounding region are presented. The urban-scale analyses were derived from a series of aircraft transects at 150 m above ground across the metropolitan area during the afternoon convective period. The results revealed that H varied by a factor of two to four in the region; the largest

values were associated with the urban heat island. LE varied by a factor of four, but low values of LE overlayed the urban heat island. Consequently, the Bowen Ratio, (H/LE) varied from 1.5 over the city to values less than 0.2 in nonurban areas. The areas along the Mississippi River and adjacent lowlying marshland northeast of the downtown area displayed smallest values of H and Bowen Ratio. The derived surface heat storage term (G) for this area as well as for the urban area exceeded either H or LE. The boundary layer over the river area is thus in a state of nonequilibrium. Author (GRA)

N84-32981# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.

DIFFUSION MODELING WITH CONVECTIVE SCALING AND EFFECTS OF SURFACE INHOMOGENEITIES

G. A. Briggs Jun. 1984 53 p refs

(PB84-210053; EPA-600/D-84/165) Avail: NTIS HC A04/MF A01 CSCL 04B

The development of convective scaling is reviewed, along with results from its application to turbulence and diffusion data. Further analysis of a wide variety of diffusion data. Further analyses of a wide variety of diffusion data for (sigma sub y) and crosswind-integrated concentration are presented in nondimensional form with convective scaling, with remarkably consistent results. Preliminary data from the CONDORS convective diffusion experiment, performed at the Boulder Atmospheric Observatory in Colorado in 1982 and 1983, are included. For elevated sources, an enhancement of peak surface concentrations over those predicted by conventional Gaussian modeling is found; the effect increases as the ratio of source height to mixing depth increases. Later sections of this paper assess the effects of surface inhomogeneities on diffusion in convective conditions. Finally, examples of heat flux inhomogeneities causing stationary convective features to develop are presented. Author (GRA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-32982# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ASPECTS OF THE BRAZIL CURRENT SYSTEM ACCORDING TO SMS-2, NOAA-6, AND TIROS-N SATELLITES FOR 1979 TO 1980 [ASPECTOS DO SISTEMA DA CORRENTE DO BRASIL SEGUNDO OS SATELITES SMS-2, NOAA-6 E TIROS-N, NOS ANOS 1979 E 1980]

Hector Manuel Inostroza Villagra and Merritt Raymond Stevenson Dec. 1983 74 p In PORTUGUESE; ENGLISH summary

(INPE-2975-RPE/450) Avail: NTIS HC A04/MF A01

The Brazil Current System was studied systematically in INPE from 1974 by utilizing THIR data of NIMBUS 5 and oceanographic data. With the regular reception of thermal and visible data from SMS-2, NOAA-6 and TIROS-N satellites it was possible to study this Current System with greater detail. Images of these satellites were interpreted by using the Image-100 System available in INPE. A more detailed and accurate description of the Current System was obtained for 1979 and 1980. The comparison of satellite data with conventional oceanographic data has given reasonably good results in the limits of the precision of the satellites systems utilized. Author

N84-32983# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SOUTHERN OSCILLATION-EL NINO EVENTS: CHARACTERISTICS, EVOLUTION, AND PRECIPITATION ANOMALIES [EVENTOS OSCILACAO DO SUL-EL NINO: CARACTERISTICAS, EVOLUCAO E ANOMALIAS DE PRECIPITACAO]

Vernon E. Kousky and Iracema F. A. Cavalcanti Dec. 1983 44 p refs In PORTUGUESE; ENGLISH summary

(INPE-2976-PRE/438) Avail: NTIS HC A03/MF A01

The climate anomalies associated with Southern Oscillation - El Nino events are highly persistent and nearly global in extent. The persistent nature of these events derives from strong coupling between atmosphere and ocean. Although the initial causes of the oscillation are unclear, once initiated the Southern Oscillation (SO) follows a certain sequence of events with well-defined effects on rainfall over a large portion of the tropics and subtropics. Drought in Australia, Indonesia, India, West Africa and Northeast Brazil, as well as excessive rainfall in the central and eastern Pacific, Peru, Ecuador and Southern Brazil, are all related to the SO. Southern Oscillation - El Nino events are also associated with dramatic changes in the tropospheric flow pattern over a broad area of both hemispheres. Wintertime upper tropospheric subtropical jets are especially pronounced as are changes in the low level trade wind regime of both the South Pacific and South Atlantic Oceans. Mid-latitude blocking patterns are also more frequent in certain regions during El Nino events. M.G.

N84-32984# Naval Research Lab., Washington, D. C.

DETERMINATION OF SEA SURFACE TEMPERATURE WITH N-ROSS (NAVY-REMOTE OCEAN SENSING SYSTEM) Final Report

J. P. Hollinger and R. C. Lo 16 Jul. 1984 63 p

(AD-A143563; NRL-MR-5375) Avail: NTIS HC A04/MF A01 CSCL 08/10

The all-weather, global determination of sea surface temperature (SST) was identified as a requirement needed to support Navy operations. The acceptable SST accuracy is + or 1.0 K with a surface resolution of 25 km. Investigations of the phenomenology and technology of remote passive microwave sensing of the ocean environment over the past decade beginning with the Navy specification of the Remote Ocean-surface Measurement System, through the NASA launched Scanning Multichannel Microwave Radiometer flown on both SEASAT and NIMBUS-7 to the planning by NASA of the Large Antenna Multichannel Microwave Radiometer, and development of the Mission Sensor Microwave/Imager (SSM/I) to be flown in 1985 by the Navy/Air Force, have demonstrated that this objective is presently attainable. Preliminary specifications and trade-off studies have been conducted to define the frequency, polarization, scan geometry, antenna size and other essential parameters, as well as the retrieval algorithms and spacecraft interface requirements, of the Low Frequency Microwave Radiometer (LFMR). As presently planned, the LFMR will be a stand alone system completely independent of the SSM/I but with a 30 rpm conical scan at 53.1 deg incidence angle identical to the SSM/I. It will be a dual-frequency system at 5.2 and 10.4 GHz using a 5.9 meter deployable mesh surface antenna. It is to be flown on the Navy-Remote Ocean Sensing System satellite scheduled to be launched in late 1988. Author (GRA)

N84-32985# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.

HYDROGRAPHIC MEASUREMENTS IN THE WESTERN ARLBORAN SEA, OCTOBER 1982

T. H. Kinder, D. A. Burns, W. Teague, and M. Stirgus Apr. 1984 158 p

(AD-A143588; AD-E800972; NORDA-TN-273) Avail: NTIS HC A08/MF A01 CSCL 08/10

During October 1982, 78 CTD stations were taken in the Western Alboran Sea (Western Mediterranean). Vertical profiles of potential temperature, salinity, and density are presented along with potential temperature versus salinity correlation diagrams. A comparison of CTD and water sample data is presented, and the rationale for a salinity correction is given. Author (GRA)

N84-32986*# National Academy of Sciences - National Research Council, Washington, D. C. Ocean Climate Research Committee.

GLOBAL OBSERVATIONS AND UNDERSTANDING OF THE GENERAL CIRCULATION OF THE OCEANS Final Report

Mar. 1984 425 p refs Proc. of Workshop, Woods Hole, Mass., 8-12 Aug. 1983 Sponsored in part by NOAA

(Grant NSF OCE-83-11753/R)
(NASA-CR-173905; NAS 1.26:173905; PB84-195411) Avail: NTIS HC A18/MF A01 CSCL 08C

The workshop was organized to: (1) assess the ability to obtain ocean data on a global scale that could profoundly change our understanding of the circulation; (2) identify the primary and secondary elements needed to conduct a World Ocean Circulation Experiment (WOCE); (3) if the ability is achievable, to determine what the U.S. role in such an experiment should be; and (4) outline the steps necessary to assure that an appropriate program is conducted. The consensus of the workshop was that a World Ocean Circulation Experiment appears feasible, worthwhile, and timely. Participants did agree that such a program should have the overall goal of understanding the general circulation of the global ocean well enough to be able to predict ocean response and feedback to long-term changes in the atmosphere. The overall goal, specific objectives, and recommendations for next steps in planning such an experiment are included. GRA

N84-32987# Maryland Univ., College Park. Water Resources Research Center.
HISTORICAL AND PROJECTED SHORELINE CHANGES: OCEAN CITY AND NORTH ASSATEAGUE ISLAND, MARYLAND Technical Report, Feb. 1983 - Aug. 1983
S. P. Leatherman Aug. 1983 45 p
(Contract DI-14-34-0001-2122)
(PB84-190206; TR-79; OWRT-A-065-MD(1)) Avail: NTIS HC A03/MF A01 CSCL 08C

Quantitative analysis of historical shorelines from 1850 to 1980 indicates a prevailing trend of recession along the Maryland Atlantic Coast, which has averaged 1.9 feet per year. The rate of shoreline retreat along the northern end of Assateague Island, Md., has been greatly accelerated by interruption of the net southerly littoral drift since construction of the Ocean City inlet jetties in 1934-1935. The barrier island has responded to this sediment deficiency by forming a concaval shoreline configuration and has migrated very rapidly landward along the northern end. At the present rate of migration (averaging 36 feet per year), the barrier will reach the mainland bayshore near the Ocean City airport location by the year 2000. Author (GRA)

N84-32988# National Oceanic and Atmospheric Administration, Seattle, Wash.
TOPOGRAPHIC EFFECTS OF THE ALASKAN STREAM ON SHELF CURRENTS
G. S. E. Lagerloef and G. A. Cannon Apr. 1984 150 p refs
(PB84-205137; NOAA-TM-ERL-PMEL-53; NOAA-84061104) Avail: NTIS HC A07/MF A01 CSCL 08C

Current meter observations from a deep trough on the Kodiak Island shelf show that the flow is largely barotropic and follows depth contours around the trough to form a cyclonic vortex. This year-round feature is interpreted as a Taylor-Proudman column and is reproduced with a numerical potential vorticity model. When the velocity scale is appropriately small the flow is constrained to follow isobaths in good agreement with the data. As a consequence, stronger currents accompany steeper topography as streamlines which follow isobaths converge. The purpose of this paper is to describe the circulation regime of the Kodiak shelf using current meter data in conjunction with numerical and analytical models. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-32989 California Univ., Davis.
MECHANISMS OF THERMOREGULATION OF RATS EXPOSED TO HYPERGRAVIC FIELDS Ph.D. Thesis
Conrad Bruce Monson 1983 105 p
Avail: Univ. Microfilms Order No. DA8407918

The thermoregulatory response to hypergravity achieved by centrifugation was presented. The role of heat loss, shivering and nonshivering thermogenic mechanisms in the thermoregulatory response to centrifugation, Tc, Tt and rates of oxygen consumption, VO2, were measured in rats exposed to hypergravic fields of 1.5 to 6G. The changes of Tc and Tt in serotonin depleted rats exposed to 3G fields suggested that serotonergic neurons modulate, rather than directly mediate the response of shivering and nonshivering thermogenic effectors during centrifugation. It is indicated that the controllers and effectors for shivering, nonshivering thermogenesis (NST) and heat loss are arranged in parallel and can be uncoupled during hypergravic exposure. Finally, it appears that shivering NST, and heat loss mechanisms function to regulate Tc during centrifugation but at a level lower than at 1G. The regulation of Tc at a lowered level appears to result from a decrease in the set point, the magnitude of this set point change is dependent on the acceleration field and the ambient temperature. It is indicated that in response to centrifugation, the activity of each of the distinct parallel neurocontrollers for shivering NST, and heat loss is modified and that serotonergic neurons modulate the activity of these neurocontrollers. Dissert. Abstr.

N84-32990*# National Aeronautics and Space Administration, Washington, D. C.
PUBLICATIONS OF THE NASA SPACE BIOLOGY PROGRAM FOR 1980 - 1984
Linda G. Pleasant, comp. and Judy L. Solberg, comp. Sep. 1984 99 p Prepared by George Washington Univ., Washington, D.C.
(Contract NASw-3165)
(NASA-TM-86857; NAS 1.15:86857) Avail: NTIS HC A05/MF A01 CSCL 06B

A listing of 562 publications supported by the NASA Space Biology Program for the years 1980 to 1984 is presented. References are arranged under the headings which are plant gravitational research, animal gravitational research, and general. Keyword title indexes and a principal investigator listing are also included. Author

N84-32991# Army Research Inst. of Environmental Medicine, Natick, Mass.
CORRELATION BETWEEN PLASMA FIBRONECTIN LEVEL AND MORTALITY FOLLOWING EXPERIMENTAL RATE HEAT STRESS
D. A. DuBose, J. McCreary, and L. Sowders 7 Jul. 1984 20 p
(AD-A143383; USARIEM-M-29/84) Avail: NTIS HC A02/MF A01 CSCL 06/19

Reticuloendothelial system (RES) clearance function correlates with the mortality rate associated with stresses which can induce shock. Likewise, mortality rate after experimental rat heat stress (ERHS) is altered by modulation of RES function. Since plasma fibronectin (PF) mediates in vivo phagocytosis by the RES, the relationship between mean plasma fibronectin level (MPFL) and mortality after ERHS was examined. A comparison of MPFLs prior to ERHS revealed that rats which ultimately comprised the survival group had a MPFL (269.0 + 11.2 microgram/ml) which exceeded the value determined for the non-survivors (252.9 + or - 11.9 microgram/ml). Both groups had elevated MPFLs, up to 12 h following ERHS. However, after this time, MPFL began to decline. The decline was more severe for the non-survivors, with MPFLs at 15, 18, and 24 h, significantly ($p<0.01$) lower than the values for the survival group. GRA

N84-32992# Ottawa Univ. (Ontario). Dept. of Electrical Engineering.
STUDIES OF THE ELECTRIC FIELD DISTRIBUTION IN BIOLOGICAL BODIES: EXPERIMENTAL DOSIMETRY AT RADIO FREQUENCIES Annual Scientific Report, 1 Jun. 1983 - 31 May 1984
S. S. Stuchly and M. A. Stuchly May 1984 110 p
(Contract N00014-82-G-0011)
(AD-A143507) Avail: NTIS HC A06/MF A01 CSCL 06/18

This report summarizes research progress in the period from June 1, 1983 to May 31, 1984 in studies of the specific absorption rate (SAR) in a model of the human body exposed to radiofrequency

radiation in the far and near field of antennas. The objective of the project was to develop and evaluate a computer-controlled system for measurements of the spatial distribution of the SAR in simulated and real biological bodies and to perform measurements on a model of the human body in the near field of typical antennas. In summary, our investigations of the SAR distribution in a full-scale mode of man showed that relevant dosimetric data in the far and the near field can be conveniently and accurately obtained by the measurements using implantable electric field probes and computer-controlled data acquisition system. Such information cannot be reliably obtained using presently available numerical methods. GRA

N84-32993# Los Alamos Scientific Lab., N. Mex.
RAPID MICROBIAL IDENTIFICATION BY CIRCULAR INTENSITY DIFFERENTIAL SCATTERING
Charles T. Gregg and Gary C. Salzman Jun. 1984 28 p refs Presented at the 4th Intern. Symp. on Rapid Methods and Automation in Microbiol., Berlin, West Germany, 7-10 Jun. 1984
(Contract W-7405-eng-36)
(DE84-013894; LA-UR-84-1796; CONF-8406148-1) Avail: NTIS HC A02/MF A01

Circular Intensity Differential Scattering (CIDS) is a technique of microbial identification. The CIDS spectra can be measured as a function of wavelength, scattering angle, and/or matrix element, and a number of matrix elements can be measured virtually simultaneously. This panoply of measurements potentially gives the method resolving power for microbial identification. Some representative data taken over the past couple of years on CIDS spectra of several antiviral vaccines is presented. DOE

N84-32994# Harvard Univ., Cambridge, Mass.
UNRAVELING PHOTOSYSTEMS Progress Report
1984 3 p
(Contract DE-AC02-82ER-12085)
(DE84-013812; DOE/ER-12085/1) Avail: NTIS HC A02/MF A01

Each of the three cyanobacteria examined contains two or more genes for the B protein of photosystem II of photosynthesis. One of these genes from the cyanobacterium fremyella dipolosiphon was sequenced. Synthetic oligopeptides were used to raise antibodies to two ten amino acid-long sequences of the 32 kilodalton B protein. To examine whether it is possible for chloroplast promoter sequences (and hence possibly chloroplast genes) to function in cyanobacteria. A series of plasmids containing the chloramphenicol acetyl transferase (CAT) gene minus its bacterial promoter was used. It appears that chloroplast promoters are recognized in cyanobacteria and act efficiently. DOE

N84-32995# California Univ., Berkeley. Lawrence Berkeley Lab.
ROLES OF IONIZING RADIATION IN CELL TRANSFORMATION
C. A. Tobias, N. W. Albright, and T. C. Yang Jul. 1983 33 p refs Presented at Neyman-Kiefer Conf., Berkeley, Calif., 1 Jul. 1983
(Contract DE-AC03-76SF-00098)
(DE84-013397; LBL-17448; CONF-8307122-2) Avail: NTIS HC A03/MF A01

The hypothesis that both lethal radiation action and cell transformation are results of similar processes the production of lesions in DNA followed by time dependent repair is presented. Lethal effects of radiation damage and radiation-induced cell transformation both appear to be the results of misrepair. A quantitative biological model intended to describe the lethal effects on mammalian cells of heavily ionizing tracks is introduced. R.S.F.

N84-32996# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
8 Aug. 1984 117 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-84-018) Avail: NTIS HC A06/MF A01

Research and progress in the USSR in the disciplines of life sciences, biomedical and behavioral science is reported. Topics discussed include: aerospace medicine, biotechnology, food technology, medicine, microbiology, and radiation biology. For individual titles, see N84-32997 through N84-33002.

N84-32997# Joint Publications Research Service, Arlington, Va.
PILOT JET LAG EXPERIMENTS DESCRIBED c52
V. Golovanov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 1-3 Transl. into ENGLISH from Sovetskaya Rossiya (Moscow), 22 Apr. 1984 p 6 (For primary document see N84-32996 22-51)
Avail: NTIS HC A06/MF A01

Working conditions for flight crews during long distance flights were investigated. Jet lag, physiological and biological effects during crossing of time and climate zones were measured. Temperature and humidity effects on the pilots were examined. Human short term adjustment to extreme changes in time and climate are discussed. E.A.K.

N84-32998# Joint Publications Research Service, Arlington, Va.
EFFECT OF CYCLIC CHANGES IN CULTIVATION CONDITIONS OF GROWTH KINETICS AND PHYSIOLOGICAL PROPERTIES OF YEASTS Abstract Only
D. P. Sokolov, S. A. Lirova, and Ye. A. Sokolova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 9 Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 52, no. 6, Nov.-Dec. 1983 p 909-916 (For primary document see N84-32996 22-51)
Avail: NTIS HC A06/MF A01

The effects of nonstationary conditions created by rapid changes in pH and pO2 during periodic cultivation of yeasts on their growth rate, economical coefficient and morphophysiologic characteristics were evaluated. The nonstationary conditions represented pH changes ranging from 2.6 to 7.5, 4.5 to 7.5 and 4.5 to 2.5 and the reverse of each pair, within a short time interval; pO2 was altered from the normally required level to a practically anaerobic condition. It is shown that cyclic changes in pH and pO2 during the experimental growth period increase specific growth rate from 0.33 to 0.5-0.6 hrs minus 1 without lowering the economic coefficient. The formation of intermediate products during the oxidation of yeasts and their use during aerobic stage of the cyclic regimens was discussed. A mathematical model is described for yeast growth in nonsteady conditions which accounts for the formation of and utilization of possible intermediate biosynthetic products. E.A.K.

N84-32999# Joint Publications Research Service, Arlington, Va.
MICROBIOLOGY AND FOOD PROGRAM
In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 13-17 Transl. into ENGLISH of Ekonomicheskaya Gazeta (Moscow), no. 51, Dec. 1983 p 1-2 (For primary document see N84-32996 22-51)
Avail: NTIS HC A06/MF A01

The importance of the microbiological industry in food supply is outlined. Acceleration of the development of production by microbiological synthesis is discussed. The significance of the output of necessary items in animal husbandry of commercial fodder microbiological protein and lysine and of other production is emphasized. The progress in implementing the scientific and technical programs for the development of progressive technologies and equipment for microbiological industry is discussed. E.A.K.

N84-33000# Joint Publications Research Service, Arlington, Va.
MODELING OF LETHAL ELECTRIC SHOCK c52
V. A. Vostrikov, V. Ya. Tabak, and M. S. Bogushevich *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 40-43 refs Transl. into ENGLISH from Anesteziologiya i Reanomatologiya (Moscow), no. 2, Mar.-Apr. 1984 p 52-53 (For primary document see N84-32996 22-51)
Copyright. Avail: NTIS HC A06/MF A01

The problem of electric shock is examined. Ventricular fibrillation (sudden death) was found to be the most frequent cause of those fatalities; this is a characteristic arrhythmia when a low voltage (127-380 V) A.C. current (50-400 Hz) passes through the

cardiac region, which results from functional disturbances in excitation and conduction processes in cardiac muscle. The introduction of electropulse therapy (cardiac defibrillation) into clinical and experimental practice allows the control of this very dangerous rhythmic disturbance. The problem of lethal electric shock, however, is not limited to ventricular fibrillation only. Data on frequent fatalities following high voltage (1000 V) contact both with and without ventricular fibrillation are presented. Substantial injuries both to cardiac muscle and other vitally important organs and systems are indicated. E.A.K.

N84-33001# Joint Publications Research Service, Arlington, Va.
RESISTANCE OF MICROORGANISMS FROM MESOSPHERE TO PERIODIC FREEZING-THAWING Abstract Only
A. A. Imshenetskiy, S. V. Lysenko, T. M. Kozlova, and A. T. Novichkova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 49-50 Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 52, no. 6, Nov.-Dec. 1983 p 902-908 (For primary document see N84-32996 22-51)
Avail: NTIS HC A06/MF A01

Earth atmosphere represents a gaseous membrane which is subdivided by its composition, temperature and electric characteristics into four subdivisions: troposphere, stratosphere, mesosphere and thermosphere. Microflora exists in earth atmosphere, both in the positive and negative temperature zones. These microorganisms originate in the earth crust and the effect of freezing and thawing on these microorganisms were studied. It is shown that after 10 freeze/thaw cycles the outer backbone layer of these special envelopes broke down and the plasmalemma membrane became stratified. It is found that with sun radiation, the exposure to periodic freeze/thaw cycles lowers the number of microorganisms in earth atmosphere. E.A.K.

N84-33002# Joint Publications Research Service, Arlington, Va.
EFFECTS OF INSULIN AND HYDROCORTISONE ON ENERGY METABOLISM IN RATS IRRADIATED WITH FAST, 60 MeV NEUTRONS Abstract Only
D. A. Sutkovoy, V. A. Baraboy, and P. M. Khalyavko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 100-101 Transl. into ENGLISH from Radiobilogiya (Moscow), v. 23, no. 6, Nov.-Dec. 1983 p 805-807 (For primary document see N84-32996 22-51)
Avail: NTIS HC A06/MF A01

Parameters of energy metabolism were studied in rats irradiated with fast neutrons to define the endocrine mechanism responsible for changes in high energy compound metabolism. Irradiation of the animals with 60 MeV neutrons with a single 1 Gy dose or two 0.5 Gy doses at 7 day intervals resulted in similar biochemical changes in hepatic and muscle tissues, consisting a reduction in the concentration of ATP, total nucleotides, and elevation of the ATP/ADP ratio. The administration of exogenous hydrocortisone potentiated the effects of irradiation, while administration of insulin or of insulin-hydrocortisone combinations to the irradiated animals reversed or attenuated the effects of irradiation. It is indicated that sublethal irradiation induces an increase in glucocorticoid secretion via induction of lipid peroxidation. It is suggested that the elevated glucocorticoids are responsible for depression of ATP synthesis, while the injection of the physiological antagonist of glucocorticoids - insulin is successfully used to counteract the effects of glucocorticoids. E.A.K.

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-33003* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Sep. 1984 61 p
(NASA-SP-7011(262); NAS 1.21:7011(262) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 169 reports, articles and other documents introduced into the NASA scientific and technical information system in August 1984. Author

N84-33004# Royal Aircraft Establishment, Farnborough (England).
OXYGEN AFFINITY OF HEMOGLOBIN, 3 HOURS AFTER PASSIVE INCREASE IN ALTITUDE FROM 400 TO 1800 METRES
E. Humpeler, K. Inama, and H. Jungmann Nov. 1983 13 p refs Transl. into ENGLISH from Wiener Klinische Wochenschrift (West Germany), v. 92, no. 9, 1980 p 326-329
(RAE-Trans-2118; BR92722) Avail: NTIS HC A02/MF A01

An investigation in two parts was undertaken in nine male subjects of the effect of short exposure to moderate altitude on the oxygen affinity of hemoglobin and other parameters. Initial measurements were performed at 425 m and repeated 3 hours after ascent by cable car to an altitude of 1800 m (Untersberg, Salzburg), no muscular activity being allowed. The same protocol was repeated 3 days subsequently but the individuals were exercised on an ergometer bicycle. The intraerythrocytic 2,3-DPG concentration showed a significant increase (1.2 micro MOL/GHB) after 3 hours of altitude exposure with and without muscular exercise. Inorganic plasma phosphates decrease is in both experiments. These finding show that 3 hours after cable-car ascent to a medium altitude a DPG increase occurs which is able to counteract the Bohr effect. B.W.

N84-33005# Minnesota Univ., Duluth. Dept. of Biochemistry.
CEREBRAL METABOLISM AND BLOOD BRAIN TRANSPORT: TOXICITY OF ORGANOPHOSPHOROUS COMPOUNDS Annual Summary Report, 15 Apr. 1982 - 15 Apr. 1983
L. R. Drewes and A. K. Singh Jun. 1983 37 p
(Contract DAMD17-82-C-2136; DA Proj. 3M1-61102-BS-10)
(AD-A142705; ASR-1) Avail: NTIS HC A03/MF A01 CSCL 06/20

The overall objective of this research project is to characterize the toxic effects of sarin and soman on the brain using the isolated perfused canine brain model. During the first contract year our efforts were directed toward the following: (1) establishing the viability of isolated perfused canine brain in the presence of sarin by measuring EEG and cerebral oxygen and glucose consumption; (2) determining the effect of an acute exposure to sarin on acetylcholinesterase (AChE) activity in the isolated perfused canine brain; (3) measurement of water content and electrolyte levels in various brain regions after exposure to sarin; (4) determining the effects of sarin on free amino acids and neurotransmitters in various brain regions; (5) determining the effects of sarin on unidirectional blood-brain transport of glucose, choline, tyrosine, and glutamic acid by the indicator dilution method; and (6) development of a technique for the analysis of sarin in perfusate blood. In these studies a total of 19 perfusion experiments was conducted. In addition, brain tissue from 4 dogs was collected for non-perfused control experiments. Sarin (400 microgram) produced immediate seizure-like EEG activity in the isolated perfused canine brain. This was accompanied by significant inhibition of brain AChE. GRA

N84-33006# Science Applications, Inc., Dayton, Ohio.
DEVELOPMENT OF COLOR CRITERIA FOR ADVANCED DISPLAYS Technical Report, Sep. 1982 - Sep. 1983
Frank Ward, Denise Wilson, and Donald L. Wallquist Wright-Patterson AFB, Ohio Aerospace Medical Research Lab. May 1984 96 p
(Contract F33615-82-C-0500)
(AD-A143246; SAI-84-02-157; AFAMRL-TR-84-023) Avail: NTIS HC A05/MF A01 CSCL 05/5

The research described herein involves color calibration of a CRT, a color discrimination study, and a color-coding system using Synthetic Aperture Radar (SAR) imagery. The results of the color calibration effort showed that, with appropriate regression coefficients, color output, both on a CRT and on film could be predicted. The color discrimination study showed that color discrimination is

poorest for red colors. These data agree with our previous studies on color matching and discrimination, and we recommend caution when using the UCS representation as the index of color difference. The radar imagery color-coding study found, as have other investigators, that black and white coding is superior to color coding. If imagery is to be color-coded, hue coding is better than hue-brightness coding. GRA

N84-33007# School of Aerospace Medicine, Brooks AFB, Tex.
MEASUREMENT OF SPECIFIC ABSORPTION RATE IN HUMAN PHANTOMS EXPOSED TO SIMULATED AIR FORCE RADAR EMISSIONS Final Report, Oct. 1980 - Sep. 1981
W. D. Hurt Jun. 1984 11 p
(AF Proj. 775-7)
(AD-A143570; USAFSAM-TR-84-16) Avail: NTIS HC A02/MF A01 CSCL 06/18

It has been suggested that pulsed radiofrequency radiation (RFR) fields may produce different specific absorption rate (SAR) distributions than continuous wave (CW) exposures. SAR distributions were measured in a muscle-equivalent slab for various RFR frequencies and duty-cycle combinations. No significant differences in SAR distribution between pulsed and CW were measured. GRA

N84-33008# Health Effects Research Lab., Research Triangle Park, N. C.
IMMUNOLOGIC EFFECTS OF ELECTROMAGNETIC FIELDS (1981 - 1983)
Ralph J. Smialowicz May 1984 10 p refs
(PB84-190602; EPA-600/D-84-124) Avail: NTIS HC A02/MF A01 CSCL 06E

In vitro studies provide evidence that support and EM field induced thermal mechanism for immune effects. When proper control of culture temperatures has been achieved during in vitro exposure to EM fields, no alterations have been observed for a variety of immune cell functions. There is conflicting evidence for effects on lymphocytes exposed in vitro to amplitude modulated EM fields at 60Hz. More work is needed to determine if there exists a possible interaction between low frequency modulated EM fields and the immune system. At present, however, there is no convincing evidence from in vivo and in vitro animal studies that EM fields adversely alter the immune system at levels found in the ambient environment. GRA

N84-33009# Northrop Services, Inc., Research Triangle Park, N.C.
DOSIMETRY OF OZONE AND NITROGEN DIOXIDE IN MAN AND ANIMALS
John H. Overton, Jr. and Frederick J. Miller (Health Effects Research Lab.) May 1984 15 p refs
(PB84-195304; EPA-600/D-84-126) Avail: NTIS HC A02/MF A01 CSCL 06T

Agreement between experimental data on maximum morphological damage and maximal predicated tissue does offer promise that mathematical dosimetry models can contribute to a better understanding of effective doses in animal studies and their correspondence to human exposure levels. Modeling must be a dynamic process to take advantage of new information and evolving conceptualizations of physical, chemical, and biological processes. Qualitative extrapolations from animals to man have been indirectly in setting National Ambient Air Quality Standards. Continued development of dosimetry models, along with information on species differences in sensitivity to pollutants, have the potential to make extrapolations between animals and man more quantitative in the future. GRA

N84-33010# Health Effects Research Lab., Research Triangle Park, N. C.
INTEGRATION OF SPECIES SENSITIVITY AND DOSIMETRY DATA IN THE EXTRAPOLATION OF OZONE AND NITROGEN DIOXIDE HEALTH DATA FROM ANIMALS TO MAN
J. A. Graham and G. E. Hatch May 1984 14 p refs
(PB84-195312; EPA-600/E-84-125) Avail: NTIS HC A02/MF A01 CSCL 06T

Estimations of regional pulmonary doses of O3 and NO2 need to be combined with an understanding of the sensitivity of several animal species and man to equivalent tissue doses before animal to man quantitative extrapolations can be performed. Because of potential species differences in anti-oxidant defenses and repair mechanisms it is unlikely that regional lung dose-response effects will be identical across species. The concepts and their current state of experimental or theoretical validation to be addressed include the application of: (1) scaling principles between species following in vitro and in vivo exposure, (2) the parallelogram concept which directly relates acute animal to acute human effects and acute animal to chronic animal effects, thereby permitting the indirect estimation of chronic human effects, and (3) species comparisons of the health effects of O3. GRA

N84-33011# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
OCCUPATIONAL MEDICINE RELEVANT TO AVIATION MEDICINE
Loughton, England May 1984 74 p refs In ENGLISH and FRENCH Symp. held in London, 4 Oct. 1983
(AGARD-CP-341; ISBN-92-835-0354-6) Avail: NTIS HC A05/MF A01

Laser effects, toxicology, and vision problems are addressed. Among the specific topics considered are: occupational medicine; the biological and pathological effects of hydrazine; the toxicity of combustion products; the relationship among ethyl alcohol consumption, nystagmus, and the balance mechanism of the inner ear; cathode ray tubes and visual perception; laser safety; and laser damage to the eye. For individual titles, see N84-33012 through N84-33019.

N84-33012# Philips Medical Service, Eindhoven (Netherlands).
REVIEW OF OCCUPATIONAL MEDICINE RELEVANT TO AVIATION MEDICINE
H. Zuidema *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 6 p (For primary document see N84-33011 22-52)
Copyright. Avail: NTIS HC A05/MF A01

The aim and scope of occupational medicine are reviewed. The conditions required to practice occupational medicine are also considered. The following specific topics are addressed: occupational health care of the individual worker, occupational hygiene, and ergonomics. The preventive character of occupational medicine is emphasized. Aviation medicine is a subcategory of occupational medicine. R.S.F.

N84-33013# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
HYDRAZINE TOXICOLOGY: IMPACT ON SAFETY AND HEALTH IN MILITARY AVIATION
George C. Mohr *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 4 p refs (For primary document see N84-33011 22-52)
Copyright. Avail: NTIS HC A05/MF A01

Hydrazine is a chemical of considerable military interest widely used as a rocket fuel and as a propellant for gas turbine generators. Extensive studies of the acute and chronic toxicity of hydrazine were conducted previously. The protocol used for toxicological evaluation of potentially hazardous chemicals is described briefly; pertinent data on acute effects are summarized; and the results of a large scale oncogenic evaluation are reviewed. Currently accepted guidelines for occupational medical management in the workplace are presented. Author

N84-33014# Danish Defence Command, Copenhagen. Medical Services.
HANDLING OF HYDRAZINE IN THE ROYAL DANISH AIR FORCE
Knud Jessen and Sven Trautner *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 4 p (For primary document see N84-33011 22-52)
Copyright. Avail: NTIS HC A05/MF A01

The introduction of the F-16 fighter aircraft into the Royal Danish Air Force included the introduction of hydrazine as a propellant for the emergency power unit (EPU). The EPU and hydrazine are discussed briefly. The pathological effects of hydrazine exposure are reviewed along with environmental safety regulations extant in the Danish Air Force. A health examination program designed to collect baseline medical data is outlined. Three case histories of hydrazine accidents are presented. R.S.F.

N84-33015# Laboratoire Central de Biologie Aerospatiale, Paris (France). Div. de Chimie-Toxicologie.
A COMPARATIVE STUDY IN THE ANIMAL OF THE TOXICITY OF THE COMBUSTION PRODUCTS OF DIVERSE MATERIALS [ETUDE COMPARATIVE CHEZ L'ANIMAL DE LA TOXICITE DES PRODUITS DE THERMOLYSE DE DIVERS MATERIAUX]
J.-P. Delcroix and M. Guerbet *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 14 p refs In FRENCH (For primary document see N84-33011 22-52)
Copyright. Avail: NTIS HC A05/MF A01

Materials with minimal toxicity must be chosen in case of fire in an enclosed space and, more particularly, onboard aircraft. An analytical study of atmospheric products is not sufficient for evaluating the risks encountered. There must be experimentation with animals. A methodology was created which associates an original model fire and a protocol for exposing animals to toxic gas products in order to study the response to aggression of the entire organism with its susceptabilities and reactions. Objective toxicological criteria are proposed with a view towards establishing a classification of materials according to chosen danger criteria. Transl. by A.R.H.

N84-33016# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
AN UNUSUAL TOXICOLOGICAL PROPERTY OF ALCOHOL: THE DENSITY EFFECT ON THE ORGAN OF BALANCE
Kennety E. Money and Jack P. Landolt *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 8 p refs (For primary document see N84-33011 22-52)
Avail: NTIS HC A05/MF A01

The relationship among ethyl alcohol consumption, nystagmus, and the balance mechanism of the inner ear was investigated with particular concern for pilot performance during positional alcohol nystagmus (PAN). The following questions were addressed experimentally: (1) does simultaneous ingestion of heavy water with alcohol prevent the occurrence of the first phase of PAN; (2) does the second phase of PAN appear if the first phase is prevented; (3) is the second phase prolonged if the blood alcohol level is held high for a long time; and (4) does glycerol, which is denser than water, cause positional nystagmus. Nystagmus was recorded using electronystagmography. Results show that it is possible for the second phase of PAN to persist beyond 11 hours after the cessation of drinking. The cause of the second phase of PAN appears to be the presence of alcohol in the semicircular canals of the inner ear. R.S.F.

N84-33017# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
VISUAL PERCEPTION IN SYSTEMS MANAGEMENT IN AERONAUTICS [LA PERCEPTION VISUELLE DANS LES CONDUITES DE SYSTEME EN AERONAUTIQUE]
Jean-Pierre Menu, Guy Santucci, and Rene Amalberti *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 7 p refs In FRENCH (For primary document see N84-33011 22-52)
Avail: NTIS HC A05/MF A01

Informatics is present in all domains of activity and especially in aeronautics where the cathode ray tube is the preferred mechanism for presenting information. Visual perception thus attracted is analyzed under its diverse aspects. How the physical characteristics of the access stimuli are measured is described and mechanisms for information processing are then examined. A method is presented for evaluating the operator's capabilities for integrating preceeding information. Transl. by A.R.H.

N84-33018# Bundesministerium der Verteidigung, Bonn (West Germany).
EVALUATION AND CONTROL OF LASER HAZARDS
G. Holtrup *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 4 p (For primary document see N84-33011 22-52)
Copyright. Avail: NTIS HC A05/MF A01

International agreements on laser safety are summarized and the laser safety regulations valid for the West German military forces are presented. Laser materials and their associated output wavelengths are enumerated. Problems which arise from airborne laser operations are discussed along with the development of eye-safe lasers. R.S.F.

N84-33019# Centre de Recherches du Service de Sante des Armees, Clamart (France).
VISUAL FUNCTION AND THE DEFINITION OF THRESHOLDS FOR EXPOSURE TO LASER RADIATION [LA FONCTION VISUELLE ET LA DEFINITION DES SEUILS D'EXPOSITION AU RAYONNEMENT LASER]
L. Court, D. Courant, Guy Santucci (CERMA), J. P. Chevaleraud, and G. Perdriel (Service de Sante des Armees) *In* AGARD Occupational Med. Relevant to Aviation Med. May 1984 17 p refs In FRENCH (For primary document see N84-33011 22-52)
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Dangers presented by the use of lasers and more particularly those related to laser radiation are essentially due to eye impairment. If determination of the maximum value of exposure requires precise knowledge of the physical parameters and associated biological effects, the influence of laser beams on visual function should be evaluated in the dynamic perspective of sensory physiology. The threshold must express the limit value of a relation existing between the energy and/or the power dissipated in the exposed biological structure and the appearance of the smallest functional impairment or a detectable lesion capable of involving damage. This definition introduces two concepts, the choice of criteria, reversible or irreversible impairment, and the measurement, of the associated energy exchange. It thus appears that biological and physical parameters constitute a whole of which the elements react on each other in a complex dynamic. Their descriptions, the definition and criteria, and experimental results illustrate the difficulties encountered in analyzing functional impairment and in determining the exposure limits as well as call to mind the uncertainty of actual norms. Transl. By A.R.H.

N84-32997# Joint Publications Research Service, Arlington, Va.
PILOT JET LAG EXPERIMENTS DESCRIBED
V. Golovanov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 1-3 Transl. into ENGLISH from Sovetskaya Rossiya (Moscow), 22 Apr. 1984 p 6 (For primary document see N84-32996 22-51)
Avail: NTIS HC A06/MF A01

N84-33000# Joint Publications Research Service, Arlington, Va.
MODELING OF LETHAL ELECTRIC SHOCK
V. A. Vostrikov, V. Ya. Tabak, and M. S. Bogushevich *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-84-018) 8 Aug. 1984 p 40-43 refs Transl. into ENGLISH from Anesteziologiya i Reanomatologiya (Moscow), no. 2, Mar.-Apr. 1984 p 52-53 (For primary document see N84-32996 22-51)
Copyright. Avail: NTIS HC A06/MF A01

N84-33272*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY EXPERIENCE WITH ADABAS/NATURAL
Andrew Swanson *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 55-56 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

N84-33362# Massachusetts Inst. of Tech., Cambridge.
COMMUNICATIONS BIOPHYSICS
Nelson Y. S. Kiang, William T. Peake, William M. Siebert, Thomas

F. Weiss, M. C. Brown, R. A. Eatock, D. K. Eddington, J. J. Guinan, E. M. Keithley, J. B. Kobler et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 181-198 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33363# Massachusetts Inst. of Tech., Cambridge.
PHYSIOLOGY
Jerome Y. Lettvin, J. Gardner, S. Jhaveri, L. A. Kamentsky, D. Perlman, G. M. Plotkin, S. A. Raymond, S. Wiesner, G. Geiger, L. R. Carley et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 199-224 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

No abstracts in this category.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-33020*# Old Dominion Univ., Norfolk, Va. Center for Applied Psychological Studies.
VISUAL INFORMATION TRANSFER. 1: ASSESSMENT OF SPECIFIC INFORMATION NEEDS. 2: THE EFFECTS OF DEGRADED MOTION FEEDBACK. 3: PARAMETERS OF APPROPRIATE INSTRUMENT SCANNING BEHAVIOR Progress Report, 15 Feb. - 15 Aug. 1984
J. Raymond Comstock, Jr., Raymond H. Kirby, and Glynn D. Coates
Aug. 1984 4 p
(Grant NAG1-451)
(NASA-CR-173913; NAS 1.26:173913; PAL-84-32) Avail: NTIS HC A02/MF A01 CSCL 05H

Pilot and flight crew assessment of visually displayed information is examined as well as the effects of degraded and uncorrected motion feedback, and instrument scanning efficiency by the pilot. Computerized flight simulation and appropriate physiological measurements are used to collect data for standardization. M.A.C.

N84-33021*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SHOULDER AND HIP JOINT FOR HARD SPACE SUITS AND THE LIKE Patent Application
Hubert C. Vykukal, inventor (to NASA) Filed 20 Aug. 1984 22 p
(NASA-Case-ARC-11534-1; NAS 1.71:ARC-11534-1; US-Patent-Appl-SN-642602) Avail: NTIS HC A02/MF A01 CSCL 06Q

A joint between the covering and the upper arm covering (i.e., shoulder) or between the torso covering and upper leg covering (i.e., hip) is disclosed. Each joint has an outer covering and a inner covering. The outer covering has plural truncated toroidal sections decreasing in size proceeding outwardly. To accommodate the decreased size of the next section, at the smaller end of each section is an end wall filling what would othewise be a gap between the sections. Bellows like inner walls are also provided for each section fixed at one end to an inner cylindrical flange and, at the opposite end, to an end wall. Each outer section may rotate 360 deg relative to the next outer section, whereas the bellows sections do not rotate, but rather expand or contract locally as the rigid sections rotate relative to each other. NASA

N84-33022*# Martin Marietta Corp., Denver, Colo.
TELEOPERATOR HUMAN FACTORS STUDY Progress Report, 8 Aug. - 8 Sep. 1984
Sep. 1984 3 p
(Contract NAS8-35184)
(NASA-CR-173890; NAS 1.26:173890; MCR-83-607) Avail: NTIS HC A02/MF A01 CSCL 05H

The progress made on the Teleoperator Human Factors Study program is summarized. Technical and programmatic problems that were encountered are discussed along with planned activity. Work performed, future work, problems encountered, and cost information comprise the topics addressed herein. R.S.F.

N84-33023*# Narco Scientific, Houston, Tex.
DEVELOPMENT OF ENGINEERING PROTOTYPE OF LIFE SUPPORT MODULE (LSM) Final Report
Aug. 1984 104 p
(Contract NAS9-16723)
(NASA-CR-171806; NAS 1.26:171806) Avail: NTIS HC A06/MF A01 CSCL 06K

The development of an engineering prototype of a life support system is discussed. The module consists of an electrocardiogram, a defibrillator, a resuscitator, and an aspirator, as well as body temperature and blood pressure measuring instruments. A drug kit is included. R.J.F.

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N84-33024*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
[SUMMARY OF RESEARCH IN APPLIED MATHEMATICS, NUMERICAL ANALYSIS AND COMPUTER SCIENCE AT THE INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND ENGINEERING] Final Semiannual Report, 1 Oct. 1983 - 31 Mar. 1984
Aug. 1984 43 p
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172421; NAS 1.26:172421) Avail: NTIS HC A03/MF A01 CSCL 12A

Research conducted at the Institute for Computer Applications in Science and Engineering in applied mathematics, numerical analysis and computer science during the period October 1, 1983 through March 31, 1984 is summarized. M.A.C.

N84-33025# Grenoble-1 Univ. (France).
ANNALS OF THE FOURIER INSTITUTE, VOLUME 34, NO. 1 [ANNALES DE L'INSTITUT FOURIER, TOME 34, FASCICULE 1]
L. Boutet DeMonvel, ed., P. Cartier, ed., Y. Colin DeVerdiere, ed., C. Godbillon, ed., B. Gross, ed., I. Kupka, ed., B. Malgrange, ed., J. Martinet, ed., V. Poenaru, ed., and Nicolas Th. Varopoulos, ed. Imprimerie Louis-Jean 1984 283 p refs In ENGLISH and FRENCH
(ISSN-0373-0956) Avail: NTIS HC A13/MF A01

Several articles addressing various topics in pure and applied mathematics are presented. Group theory, analytic and harmonic functions, topology, cohomology, and differential operators are among the subjects discussed. For individual titles, see N84-33026 through N84-33037.

N84-33026# Paris-Sud Univ., Orsay (France). Dept. de Mathematiques.
THE FOURIER PLANCHEREL TRANSFORM FOR LIE GROUPS. 2: NILPOTENT GROUPS [LA TRANSFORMATION DE FOURIER-PLANCHEREL ANALYTIQUE DES GROUPES DE LIE. 2: LES GROUPES NILPOTENTS] c64
Nghiem Xuan Hai *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 1-37 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

The Fourier Plancherel transform for nilpotent Lie groups is given by exponentiating an infinitesimal representation of the Lie algebras by differential antisymmetrical operators of degree at most one. This transfor can be written as a Fourier integral operator the amplitude of which is the exponential of a rational phase and the inverse transform is given by the opposite phase. The phase, which is polynomial except a division by a central polynomial, gives the Fourier transform of regular differential operators on the group; and the amplitude, which is an analytic function, is also the eigen-distribution of a maximal abelian sub-algebra of differential operators on the group. M.G.

N84-33027# Sarkaria (K. S.), Chandigarh (India).
NON-DEGENERESCENCE OF SOME SPECTRAL SEQUENCES c64
K. S. Sarkaria *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 39-46 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

Each Lie algebra F of vector fields (e.g., those which are tangent to a foliation) of a smooth manifold M defines, in a natural way, a spectral sequence E sub k(F) which converges to the de Rham cohomology of M in a finite number of steps. It is proved e.g., that for all k > or = 0 there exists a foliated compact manifold with E sub k(F) infinite dimensional. M.G.

N84-33028# North Carolina Univ., Chapel Hill. Dept. of Mathematics.
SUBGROUPS OF CONTINUOUS GROUPS ACTING DIFFERENTIABLY ON THE HALF-LINE c64
J. F. Plante *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 47-56 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

Groups of diffeomorphisms of the closed half-line which fix only the end point are considered. When the group is a Lie group it is isomorphic to a subgroup of the affine group. On the other hand, when the group is isomorphic to a discrete subgroup of a solvable Lie group it is topologically equivalent to a subgroup of the affine group. M.G.

N84-33029# Paris-Sud Univ., Orsay (France). Dept. Analyse Harmonique Mathematique.
CHARACTERIZATIONS OF ZEROS IN THE FUNCTIONS OF SOME NEVANLINNA TYPE CLASSES IN THE BIDISK [CARACTERISATIONS DES ZEROS DES FONCTIONS DE CERTAINES CLASSES DE TYPE NEVANLINNA DANS LE BIDISQUE] c67
Philippe Charpentier *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 57-98 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

The zeros sets of holomorphic functions in the bidisk are considered for which the logarithm of the radius satisfies a growth condition. A Blaschke condition characterizes the zeros sets of the functions satisfying the condition integral D2 delta sub dD2 (z)alpha Log(+)/f(z)/d lambda(z) < infinity, alpha >-1 and sufficient conditions are given for smaller classes, in particular for the classical Nevanlinna class of the bidisk. M.G.

N84-33030# Hiroshima Univ. (Japan). Dept. of Mathematics.
ON THE BOUNDARY LIMITS OF HARMONIC FUNCTIONS WITH GRADIENT IN L SUP p c64
Yoshihiro Mizuta *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 99-109 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

Tangential boundary behaviors of harmonic functions with gradient in Lebesgue classes are considered. The aim is to extend a recent result of Cruzeiro concerning tangential boundary limits of harmonic functions with gradient in L(n) (R(n)+), R(n)+ denoting the upper half space of the n-dimensional euclidean space R(n). The method used here is different from that of Nagel, Rudin and Shapiro; in fact, the integral representation of precise functions given by Ohtsuka is used. M.G.

N84-33031# Federation Nationale Researche Scientifique, Liege (Belgium). Inst. de Mathematiques.
WAVE FRONTS TO INFINITY OF REAL ANALYTIC FUNCTIONS [FRONTS D'ONDE A L'INFINI DES FONCTIONS ANALYTIQUES REELLES] c64
Jean-Louis Lieutenant *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 111-140 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

Adapting the geometric and algebraic methods used by M. Sato, T. Kawai and M. Kashiwara to obtain the sheaf of microfunctions, a sheaf *(t) is functorially constructed on the cotangential sphere of a finite dimensional real vector space E. The sections of this sheaf play for analytic functions over E a role similar to that of microfunctions for hyperfunctions. Deduced from this construction is a new notion of wave front set at infinity allowing the characterization of analytic functions over E which admit specific decompositions in the sum of holomorphic functions on tubular neighborhoods of E in E + iE. M.G.

N84-33032# National Inst. for Scientific and Technical Creation, Bucharest (Romania).
THE LEVI PROBLEM FOR COHOMOLOGY CLASSES c67
Mihnea Coltoiu *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 141-154 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

Some results of Andreotti and Norguet concerning the extension of cohomology spaces are extended to complex spaces and coherent analytic sheaves. Theorems addressing both the local and global problem are proved. M.G.

N84-33033# Uppsala Univ. (Sweden). Matematiska Univ.
THE GROWTH OF PLURISUBHARMONIC FUNCTIONS IN INFINITE DOMAIN [CROISSANCE DES FONCTIONS PLURISOUSHARMONIQUES EN DIMENSION INFINIE] c67
Christer O. Kiselman *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 155-183 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

In many problems in finite dimensional complex analysis, the polar sets, i.e., the sets where a plurisubharmonic function which is not minus infinity identically takes that value, appear as exceptional sets. For instance, the growth of a plurisubharmonic function in a variable y when an other variable x is fixed, is essentially the same for all x except when x belongs to a polar set. A very precise and general result of this kind is proved when x and y vary in infinite dimensional spaces. Author

N84-33034# Grenoble-1 Univ. (France). Inst. Fourier.
SINGULARITIES CONNECTED WITH A TRACE ON A BANACH ALGEBRA [SINGULARITES ELIMINABLES POUR DES EQUATIONS SEMI-LINEAIRES] c64
P. Baras and M. Pierre *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 185-206 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

Let L be an m(th)-order differential operator on an open subset Omega of R(N); let K be a compact in Omega; gamma>1 and gamma'=gamma/(gamma-1). It is shown that every solution

of Lu+u(gamma)=0 on Omega/K,u> or = 0 satisfies Lu+u (gamma)=0 on omega when the W(m,gamma')-capacity of K is zero. This condition turns out to be necessary when L is a second order elliptic operator. In the latter case, it is proven that, given mu a finite Radon measure on omega, the equation Lu+u modulus-u(gamma-1)=mu,u-modulus sub d Omega=0 has a solution if and only if mu does not charge the sets of W(2,gamma')-capacity zero. M.G.

N84-33035# Stockholm Univ. (Sweden). Dept. of Mathematics.
ON THE CLOSURE OF SPACES OF SUMS OF RIDGE FUNCTIONS AND THE RANGE OF THE X-RAY TRANSFORM c67
Jan Boman *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 207-239 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

For (a) being an element of R(n)/[0] and Omega an open bounded subset of R(n) define (L(p)(Omega,a) as the closed subset of L(p)(Omega) consisting of all functions that are constant almost everywhere a(v) is an element of R(n)/[0], v=1,...,m it is studied for which Omega it is true that the vector space (*)L(p)(Omega,a(1))+...+L(p)(Omega, a(m)) is a closed subspace of L(p)(Omega). This problem arises naturally in the study of image reconstruction from projections (tomography). M.G.

N84-33036# Geneva Univ. (Switzerland). Section de Mathematiques.
DETERMINANTS CONNECTED WITH A TRACE ON A BANACH ALGEBRA [DETERMINANT ASSOCIE A UNE TRACE SUR UNE ALGEBRE DE BANACH] c67
P. delaHarpe and G. Skandalis (Paris 6 Univ.) *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 241-260 refs In FRENCH; ENGLISH abstracts (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

Let A be a complex Banach algebra, let GL(infinity)(A) be the stable general linear group of A, and let GL(0/infinity)(A) be its connected component for the norm topology. It is shown that for any nonzero trace tau: A approaches C, one may define a homomorphism delta(tau) from GL(0/infinity)(A) onto the quotient of the additive group C by the image bar-tau(K(0)(A)) of the Grothendieck group of A. If A-M sub n(C) (respectively if A is a finite continuous factor) with the usual trace, then exp(i 2pi delta sub tau) is the usual determinant. In general the determinants delta sub tau make it possible to study the derived groups of GL(0/1)(A) and GL(0/infinity)(A), and thus also the relationship between the Whitehead groups K sub 1 (A) and K(top/1)(A). M.G.

N84-33037# Nancy Univ. (France).
FATOU THEOREM FOR THE PROPER FUNCTIONS OF INVARIANT POTENTIAL OPERATORS BY A GROUP OF CARTAN DISPLACEMENTS [THEOREME DE FATOU POUR LES FONCTIONS PROPRES DES OPERATEURS DIFFERENTIELS INVARIANTS PAR UN GROUPE DE DEPLACEMENTS DE CARTAN] c64
Noureddine El-Jaouhari *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 261-270 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

The behavior of Poisson integrals (at infinity) convected with the Cartan motion groups is studied. Author

N84-33038# Grenoble-1 Univ. (France).
ANNALS OF THE FOURIER INSTITUTE, VOLUME 34, NO. 2 [ANNALES DE L'INSTITUT FOURIER, TOME 34, FASCICULE 2]
L. Boutet DeMonvel, ed., P. Cartier, ed., Y. Colin DeVerdiere, ed., C. Godbillon, ed., B. Gross, ed., I. Kupka, ed., B. Malgrange, ed., J. Martinet, ed., V. Poenaru, ed., and Nicolas Th. Varopoulos, ed. Luisant, France Imprimerie Durand 1984 285 p refs In ENGLISH and FRENCH
(ISSN-0373-0956) Avail: NTIS HC A13/MF A01

Fourteen articles addressing various topics in pure and applied mathematics are presented. Algebraic number theory, conformal mapping, group theory, differential operators, Hessian functions, integral transforms, random walks, and analytic functions and spaces are some of the subjects discussed. For individual titles, see N84-33039 through N84-33052.

N84-33039# Universite de Franche-Comte, Besancon (France). Dept. de Sciences-Mathematiques.
INFINITESIMAL L-CLASSES OF A GROUP OF ALGEBRAIC NUMBERS [L-CLASSES INFINITESIMALES D'UN CORPS DE NOMBRES ALGEBRIQUES] c64
Jean-Francois Jaulent *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 1-27 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

The notions of infinitesimal numbers and ideals attached to an algebraic number field K for a given prime number L are introduced. An interpretation is given of the Galois group A(K) of the maximal abelian l-extension of K unramified outside l as the quotient of the tensor product Z sub l x (Z)J(K) (J(K): group of ideals prime to l) by its submodule generated by the principal-infinitesimal ideals. Various consequences are obtained for the groups A(K); in particular, the existence of a genus theory which looks like the usual one is demonstrated. M.G.

N84-33040# Rouen Univ. (France). Dept. de Mathematiques.
CONFORMAL MAPPING AND ALMOST LIPSCHITZIAN CURVES [REPRESENTATION CONFORME ET COURBES PRESQUE LIPSCHITZIENNES] c67
Michel Zinsmeister *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 29-44 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

The almost Lipschitzian domains define by David are studied from the point of view of conformal mapping. In addition, the problem of approximating these domains by Lavrentiev's domains is discussed. M.G.

N84-33041# Lyon-1 Univ. (France). Lab. d'Analyse Fonctionnelle.
CANONIC MEASUREMENTS IN THE CLASSIC MOMENT PROBLEM [MESURES CANONIQUES DANS LE PROBLEME CLASSIQUE DES MOMENTS] c64
H. Buchwalter and G. Cassier *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 45-52 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

Given a classical Hamburger indeterminate moment problem, then a measure solution Mu is m-canonic if and only if the closed hull H of the polynomials space is exactly of codimension m in the Hilbert space L(2)(mu). Some results about perturbation of m-canonic measures are given, which generalize those obtained for N-extremal measures. M.G.

N84-33042# Indian Statistical Inst., New Delhi. Dept. of Mathematics.
ON THE A-INTEGRABILITY OF SINGULAR INTEGRAL TRANSFORMS c67
Shobba Madan *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 55-62 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

The weak type Hardy spaces of harmonic functions in the upper half plane R(n+1,+) are studied and the A-integrability of singular integral transforms defined by Calderon-Zygmund kernels is proved. This generalizes the corresponding result for Riesz transforms proved by Alexandrov. M.G.

N84-33043# Imperial Coll. of Science and Technology, London (England). Dept. of Mathematics.
AN APPLICATION OF FINE POTENTIAL THEORY TO PROVE A PHRAGMEN LINDELOEF THEOREM c67
Terry J. Lyons *In* Grenoble-1 Univ. Ann. of the Fourier Inst.,

Vol. 34, No. 2 1984 p 63-66 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

A proof of a Phragmen Lindelof theorem due to W. Fuchs is given. The theorem is valid for an arbitrary open subset U of the complex plane: if f is analytic on U, bounded near the boundary of U, and the growth of f is at most polynomial then either f is bounded or U contains [modulus-z > r] for some positive r and f has a simple pole. M.G.

N84-33044# Paris VI Univ. (France). Dept. de Mathematiques.
ANALYTIC AUTOMORPHISMS OF A BOUNDED REINHARDT DOMAIN IN A COMPLEX BANACH SPACE WITH BASE [AUTOMORPHISMES ANALYTIQUES D'UN DOMAINE DE REINHARDT BORNE D'UN ESPACE DE BANACH A BASE] **c67**
Jean-Pierre Vigue *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 67-87 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

The group of biholomorphic automorphisms of a bounded Reinhardt domain in a complex Banach space with basis is studied. It is proved that, in some cases, this group is a Banach-Lie group and a complete classification of bounded Reinhardt homogeneous domains is given. For several special Banach spaces, it is proved that the open unit-ball gets only linear automorphisms. M.G.

N84-33045# Paris-Sud Univ., Orsay (France). Dept. de Mathematiques.
UNIQUENESS IN THE CAUCHY PROBLEM FOR SECOND ORDER OPERATORS WITH REAL SYMBOLS [UNICITE DU PROBLEME DE CAUCHY POUR DES OPERATEURS DU SECOND ORDRE A SYMBOLES REELS] **c64**
Serge Alinhac *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 89-109 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

Two theorems for local uniqueness in the Cauchy problem are proved for linear operators whose principle symbols p are real. The case where p has real critical points (p=dp=o) is considered assuming a weak pseudo-convexity condition (in the sense of Hormander) in a neighborhood of these points. Conditions on the subprincipal symbol of the operator are then given which ensure uniqueness. M.G.

N84-33046# New South Wales Univ., Kensington (Australia). School of Mathematics.
AN EXTENSION OF DELEEUW'S THEOREM TO THE N-DIMENSIONAL ROTATION GROUP **c67**
A. H. Dooley and G. I. Gaudry (Flinders Univ., Bedford Park, Australia) *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 111-135 refs Sponsored by the Australian Research Grant Scheme (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

A method of approximating representations of the group M(n) by those of the group SO(n+1) is studied. As a consequence, a version of a theorem of deLeeuw for Fourier multipliers of L(p) is established that applies to the restrictions of a function on the dual of M(n) to the dual of SO(n+1). Author

N84-33047# Ghent Univ. (Belgium). Seminar of Higher Analysis.
COMPLETELY CONTINUOUS MULTIPLIERS FROM L SUB 1 (G) INTO L SUB INFINITY (G) **c64**
G. Crombez and W. Govaerts *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 137-154 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

For a locally compact Hausdorff group G, the functions in L(infinity)(G) which give rise to completely continuous multipliers T sub g from L(1)(G) into L(infinity)(G) are investigated. In the case of a metrizable group, a complete description of such functions is obtained. In particular, for G(compact) all g in L(infinity)(G) induce completely continuous T sub g. M.G.

N84-33048# Paris-Sud Univ., Orsay (France). Lab. d'Analyse Numerque.
BOUNDED HESSIAN FUNCTIONS [FONCTIONS A HESSIAN BORNE] **c67**
Francoise Demengel *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 155-190 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

Some properties of distributions defined on an open set of R(N) the hessian of which is a bounded measure are examined. Topological properties are first stated, as the weak compacity of bounded sets of HB(omega) when omega is bounded, the density of smooth functions for a topology sufficiently sharp. The question of the behavior of such distributions on the boundary of omega is then addressed. This leads to the study of the same question for functions of W(2,1)(omega). Finally, Sobolev imbedding theorems appropriate in this context are proved, specifically imbedding into same set of continuous functions. Author

N84-33049# Grenoble-1 Univ. (France). Lab. de Mathematiques Pures.
INFINITESMAL DEFORMATION OF LOCALLY SYMMETRICAL RIEMANN SPACES. 2: BLASCHKE'S INFINITESIMAL CONJECTURE FOR COMPLEX PROJECTIVE SPACE [DEFORMATIONS INFINITESIMALES DES ESPACES RIEMANNIENS LOCALEMENT SYMETRIQUES. 2: LA CONJECTURE INFINITESIMALE DE BLASCHKE POUR LES ESPACES PROJECTIFS COMPLEXES] **c67**
J. Gasqui and H. Goldschmidt (Columbia Univ., New York, N.Y.) *In its* Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 191-226 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

It is proved that a symmetric 2-form on a complex projective space of dimension > or = 2, endowed with its canonical metric g, whose integrals vanish over the geodesics of g, is a Lie derivative of the metric g. M.G.

N84-33050# Toulouse Univ. (France). Dept. de Mathematiques.
SERRE'S SPECTRAL SEQUENCE AND HOMOTOPY [SUITES SPECTRALES DE SERRE EN HOMOTOPIE] **c67**
A. Didierjean and A. Legrand *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 227-242 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

Many problems are reduced to computation of homotopy groups Pi*(Hom((X,x sub 0), (Y,y sub 0))). In the stable range, i.e., when Y is an omega spectrum, the generalized Serre spectral sequence is an important tool. Here we exhibit such a spectral sequence in the unstable range. Examples of computation are given, for sets of L-equivalences, for Haefliger gamma-structure and for cohomotopy. M.G.

N84-33051# Paris VI Univ. (France). Analyse Complexe et Geometrie.
BROWNIAN MOTION AND RANDOM WALKS ON MANIFOLDS **c64**
Nicolas Th. Varopoulos *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 243-269 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

A procedure is developed that allows one to decretise the Brownian motion on a Riemannian manifold. Thus a random walk is constructed which is a good approximation of the Brownian motion. Author

N84-33052# Cambridge Univ. (England). Emmanuel Coll.
ALGORITHMIC INTEGRATION OF ELEMENTARY TRANSCENDENTAL FUNCTIONS ON AN ALGEBRAIC CURVE [INTEGRATION ALGORITHMIQUE DES FONCTIONS ELEMENTAIREMENT

TRANSCENDANTES SUR UNE COURBE ALGEBRIQUE] c64
J. H. Davenport *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 271-276 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

The problem of determining the solutions of an ordinary differential equation of Risch type on an algebraic curve is considered. In fact, a relatively straight-forward generalization of Risch's method gives the answer which allows one to generalize his integration algorithm to elementary transcendental extensions of algebraic extensions of the rational functions. Author

N84-33053*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE WELL-POSEDNESS OF THE KURAMOTO-SIVASHINSKY EQUATION Final Report
Eitan Tadmor Aug. 1984 24 p refs
(Contract NAS1-17070)
(NASA-CR-172431; ICASE-84-36; NAS 1.26:172431) Avail: NTIS HC A02/MF A01 CSCL 12A

The Kuramoto-Sivashinsky equation arises in a variety of applications, among which are modeling reaction diffusion systems, flame propagation and viscous flow problems. It is considered here, as a prototype to the larger class of generalized Burgers equations: those consist of a quadratic nonlinearity and an arbitrary linear parabolic part. It is shown that such equations are well posed, thus admitting a unique smooth solution, continuously dependent on its initial data. As an attractive alternative to standard energy methods, existence and stability are derived in this case, by patching in the large short time solutions without loss of derivatives. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N84-33054 Georgia Inst. of Tech., Atlanta.
THE DESIGN AND PERFORMANCE OF A PARALLEL COMPUTER ARCHITECTURE FOR SIMULATION Ph.D. Thesis
James Ovid Hamblen 1984 107 p
Avail: Univ. Microfilms Order No. DA8411316

An efficient parallel digital computer architecture is developed for the numerical solution of ordinary differential equations with initial value conditions. This research consists of five specific phases. First, the computer architecture is formulated by an analysis of the parallelism inherent in the block diagram structure of simulation problems. Second, a performance model is developed for this architecture. Third, the performance model is used to select numerical integration and function evaluation techniques which maintain the desired accuracy levels and computational speed. Fourth, several benchmark problems are implemented on an experimental prototype. Fifth, measurements for the performance model are taken from the experimental prototype and used for comparison with existing analog and digital systems. An experimental prototype capable of supporting 32 processors has been designed and built. Dissert. Abstr.

N84-33055 Department of the Air Force, Washington, D.C.
PROGRAMMABLE ARITHMETIC LOGIC UNIT Patent
G. I. Miller, inventor (to Air Force) Issued 12 Jun. 1984 4 p Supersedes AD-D009495
(AD-D011128; US-Patent-4,454,589; US-Patent-Appl-SN-357440; US-Patent-Class-364-716) Avail: US Patent & Trademark Office CSCL 09/2

A programmable arithmetic logic unit for performing high speed bit sliced, pipelined computations at very low power is fabricated as a LSI component using CMOS/SOS technology. It is microprogrammable and operates in conjunction with a fast microprogram store program memory and controller. Dual input ports which supply data from eight sources are latched and operated on while new data is simultaneously fetched. Instruction bits shift data in either port left or right, select complements and select an operand between device input and output data in one port. The data processed in each port is compared and is added to provide a latched tri-state output to an external device. Author (GRA)

N84-33056*# Virginia Univ., Charlottesville. Dept. of Applied Mathematics.
RESEARCH IN COMPUTER SCIENCE Semiannual Report
James M. Ortega Jul. 1984 8 p refs
(Contract NAG1-242)
(NASA-CR-173857; NAS 1.26:173857; UVA/528209/AMCS85/105) Avail: NTIS HC A02/MF A01 CSCL 09B

The research efforts of University of Virginia students under a NASA sponsored program are summarized and the status of the program is reported. The research includes: testing method evaluations for N version programming; a representation scheme for modeling three dimensional objects; fault tolerant protocols for real time local area networks; performance investigation of Cyber network; XFEM implementation; and vectorizing incomplete Cholesky conjugate gradients. S.B.

N84-33057# National Bureau of Standards, Washington, D.C.
I/O CHANNEL INTERFACE
29 Jul. 1983 117 p refs
(NBS-FIPS-Pub-60-2) Avail: NTIS HC A06/MF A01

The functional, electrical, and mechanical interface specifications for connecting computer peripheral equipment as a part of automatic data processing (ADP) systems are defined. This standard, and a companion standard for power control, defines the hardware characteristics for the I/O channel level interface. Device class specific operational specifications standards are also required for each class of peripheral device to achieve full plug-to-plug interchangeability of peripheral components. These operational specifications standard will be proposed as Federal Information Processing Standards to accompany this standard as they are developed. The employment of this I/O Channel Interface standard is to reduce the cost of data processing requirements through increasing its available alternative sources of supply for computer system components at the time of initial system acquisition in system replacement and augmentation and in system component replacement. This standard is expected to lead to improved reutilization of system components. E.A.K.

N84-33058# Aeronautical Research Labs., Melbourne (Australia).
ARRAY PROCESSOR UTILIZATION IN THE COMPUTATION OF REAL-TIME IMAGES
L. N. Lester Aug. 1984 22 p refs
(ARL-SYS-TM-73; AR-003-953) Avail: NTIS HC A02/MF A01

The application of an array processor to the real time generation of aircraft images in Air Traffic Control tower simulation is described. Particular emphasis is placed upon the problems which arises in achieving efficient utilization of the array processor. The time required to transfer data from the host to the array processor is a serious consideration in the partitioning of the algorithm between the two processors. Array processor execution speed is about ten times faster than a host FORTRAN routine, provided that the array processor code is written to maximize the number of parallel computing elements used and to minimize loop lengths by pipelining of operations. These requirements result in a considerable software development effort. A timing analysis of the resultant array processor code is also presented. Author

N84-33059*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE IMPACT OF COMMUNICATION COMPLEXITY IN THE DESIGN OF PARALLEL NUMERICAL ALGORITHMS Final Report
Dennis Gannon (Purdue Univ., Lafayette, Ind.) and John VanRosen-

dale Aug. 1984 38 p refs
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172436; ICASE-84-41; NAS 1.26:172436) Avail: NTIS HC A03/MF A01 CSCL 09B

This paper describes two models of the cost of data movement in parallel numerical algorithms. One model is a generalization of an approach due to Hockney, and is suitable for shared memory multiprocessors where each processor has vector capabilities. The other model is applicable to highly parallel nonshared memory MIMD systems. In the second model, algorithm performance is characterized in terms of the communication network design. Techniques used in VLSI complexity theory are also brought in, and algorithm independent upper bounds on system performance are derived for several problems that are important to scientific computation. Author

N84-33060# Applied Modeling, Inc., Woodland Hills, Calif.
DESIGN, TEST, AND EVALUATION OF AN AIR FORCE ENVIRONMENTAL MODEL AND DATA EXCHANGE Final Report, Sep. 1982 - Sep. 1983
M. R. Albertson and K. T. Tran Tyndal AFB, Fla. AF Engineering and Services Lab. Apr. 1984 29 p
(Contract F41689-82-C-0068)
(AD-A143226; AFESC/ESL-TR-84-14) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report documents development of a prototype computer system designed to assist environmental quality staff at an Air Force major command. The computer system, an integration of current technology, permits error detection and high-speed processing for modeling, simulation studies, and network operations. Functionally designed to meet novice user requirements, the multiuser system can be inexpensively expanded to accommodate larger workloads. The capabilities of the prototype system meet data base access and extraction requirements for capture and subsequent manipulation of information and environmental quality data needed to perform environmental assessments. The prototype can serve as a test bed for lead-in applications, locally defined processing, and network operations. Author (GRA)

N84-33061# Iowa Univ., Iowa City. Div. of Information Engineering.
TEST PROCEDURES AND DESIGN METHODS FOR RELIABLE LARGE SCALE INTEGRATED CIRCUITS AND SYSTEMS Final Report, 9 Jan. 1982 - 31 Aug. 1983
S. M. Reddy Jan. 1984 7 p
(Grant AF-AFOSR-3582-78)
(AD-A143324; AFOSR-84-0555TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The following four major problem areas were investigated in the course of the research supported: (1) procedures to detect faults in random access memories; (2) analysis and design of fault-tolerant computing networks; (3) design of testable microprocessors and iterative logic arrays; and (4) design and analysis of fault-tolerant connection networks. Author (GRA)

N84-33062# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
BATTERY COMPUTER SYSTEM (BCS) HUMAN FACTORS FIELD EVALUATION Final Report, Jan. - Mar. 1982
E. R. Smootz and R. A. Kass Jul. 1984 97 p
(AD-A143425; ARI-RN-84-108) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report presents the results of a human factors evaluation of the Battery Computer System (BCS). The evaluation was part of a Follow-On Evaluation, Operational Test 706, conducted by the U.S. Army Operational Test and Evaluation Agency (OTEA) in January through March, 1982. Numerous human factors problems were identified. The results were incorporated into the OTEA final report and were used in determining what modifications were needed to the BCS before entering into full scale production. Author (GRA)

N84-33063# Air Command and Staff Coll., Maxwell AFB, Ala.
IBM'S TOKEN-RING LAN (LOCAL-AREA NETWORK): A BASE-LEVEL COMMUNICATIONS SOLUTION Student Report
J. D. Wells Apr. 1984 42 p
(AD-A143446; ACSC-84-2765) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document reviews the computer revolution and information explosion within the Air Force and their part in increased data communications requirements. It investigates the local-area network topologies for capabilities and characteristics that are advantageous in a CONUS, non-secure, base-level configuration. Focused upon are the bus and ring topologies. Then a closer examination is made of a hybrid star-ring local area network (LAN) utilizing a token-access control mechanism. This LAN, as proposed by IBM, is seen to have superior maintainability, reliability, and flexibility. Author (GRA)

N84-33064# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
[SUMMARY OF RESEARCH PERFORMED AT MIT LABORATORY FOR COMPUTER SCIENCE] Annual Progress Report, 1 Jul. 1981 - 30 Jun. 1982
M. L. Dertouzos 1 May 1984 287 p
(Contract N00014-75-C-0661)
(AD-A143459; MIT/LCS-PR-19) Avail: NTIS HC A13/MF A01 CSCL 09/2

This report summarizes the research performed at the MIT Laboratory for Computer Science from July 1, 1981 through June 30, 1982. The Contents Include: Computer Systems and Communications; Computer Systems Structures; Educational Computing Group; Functional Languages and Architecture Group; Information Mechanics; Message Passing Semantics; Office Automation; Programming Methodology; Programming Technology; Real Time Systems; Systematic Program Development. GRA

N84-33065# Purdue Univ., Lafayette, Ind. Dept. of Computer Sciences.
[THE BLUE CHIP PROJECT] Final Report, 1 Jan. 1981 - 31 Dec. 1983
L. Snyder 19 Jul. 1984 15 p
(Contract N00014-81-K-0360; SRO-100)
(AD-A143474) Avail: NTIS HC A02/MF A01 CSCL 09/2

The major accomplishments of the Blue CHiP Project are described in the areas of theory, algorithms, architecture, software, and VLSI. Author (GRA)

N84-33066# Los Alamos Scientific Lab., N. Mex.
MECA: A SUPERCOMPUTER FOR MONTE CARLO
J. C. Solem Apr. 1984 6 p refs
(Contract W-7405-eng-36)
(DE84-014129; LA-10005) Avail: NTIS HC A02/MF A01

Discrete-ordinates and Monte Carlo techniques for solving integrodifferential equations and their relative adaptability to vector processes are compared. The utility of multiprocessors for Monte Carlo calculation and a simple architecture (the monodirectional edge-coupled array of MECA) that is ideally suited to Monte Carlo and overcomes many of the packaging problems associated with more general multiprocessors is described. DOE

N84-33067# Urban Mass Transportation Administration, Washington, D.C. Methods Div.
MICROCOMPUTERS IN TRANSPORTATION: SOFTWARE AND SOURCE BOOK
Sep. 1983 146 p refs Prepared in cooperation with FHA, Washington, D.C.
(PB84-195155; UMTA-URT-41-83-11) Avail: NTIS HC A07/MF A01 CSCL 09B

The Urban Mass Transportation Administration (UMTA) and the Federal Highway Administration (FHWA) of the U.S. Department of Transportation provide training and technical assistance in the new and rapidly changing area of transportation application of microcomputers. These two agencies maintain up-to-date microcomputer references for transit and paratransit operators, transpor-

tation planners, and traffic engineers. This document contains information pertaining to: (1) microcomputer references and training, and; (2) descriptions of software in the areas of transit operations, transportation planning, traffic engineering, and paratransit planning and operations. GRA

N84-33068# Economic Research Service, Washington, D. C. International Economics Div.
SEARCH COMMAND FOR CHARACTER STRINGS AND WORDS IN COMPUTER FILES ON CMS (CONVERSATIONAL MONITOR SYSTEM)
R. M. Seeley May 1984 55 p refs
(PB84-201243; AGES-840416) Avail: NTIS HC A04/MF A01 CSCL 09B

A computer command, SEARCH, which allows searching for a variable, word, number, or other character string in a specified group of files is described. The search is user restrictive to finding a freestanding word or variable. The command records each line number and file name. Parameters of the search are fully detailed. Searching time is cut, in some cases, from several hours to several minutes. Flow charts of the program which make up the search command are give. SEARCH is comparable to the UNIX operating system's GREP, and runs on the Conversational Monitor System. E.R.

N84-33069# Institute for Telecommunication Sciences, Boulder, Colo.
COMPUTER-BASED TRANSMISSION MONITOR AND CONTROL SYSTEM
J. E. Farrow and R. E. Skerjanec Apr. 1984 45 p refs Sponsored in part by Air Force
(PB84-202068; NTIS/Rept-84/147) Avail: NTIS HC A03/MF A01 CSCL 09B

A minicomputer-based communication system monitor used by the U.S. Department of Defense to improve the performance and reduce the operating costs of the new multi-channel digital transmission system is described. A brief history of the development of the monitor and a description of the present-generation hardware and software are included. Author (GRA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-33070 Yale Univ., New Haven, Conn.
EDITING BY EXAMPLE Ph.D. Thesis
Robert Peter Nix 1983 184 p
Avail: Univ. Microfilms Order No. DA8411539

An editing by example system is an automatic program synthesis facility embedded in a text editor that is used to solve repetitive text editing problems. The user provides the editor with a few examples of text transformation. The system analyzes the examples and generalizes them into a program that can perform the transformation to the rest of the user's text. The design, analysis, and implementation of a practical editing by example system are presented. In particular, the problem of synthesizing a text processing program that generalizes the transformation that is implicitly described by a small number of input/out examples is studied. A class of text processing programs called gap programs are defined, their computational power characterized, the problem associated with synthesizing them from examples are studied, and an efficient heuristic that synthesizes a gap program from examples of its input/output behavior is derived. Dissert. Abstr.

N84-33071*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
RESEARCH ON OUTPUT FEEDBACK CONTROL OF SYSTEMS WITH ILL-CONDITIONED DYNAMICS Interim Report, Jan. - Jun. 1984
Anthony J. Calise and Daniel D. Moerder Aug. 1984 15 p
(Grant NAG1-243)
(NASA-CR-173921; NAS 1.26:173921) Avail: NTIS HC A02/MF A01 CSCL 09B

The accuracy of a two time scale approach to the output feedback regulator design problem is examined. An approximate quadratic performance index which reflects a two time scale decomposition of the system dynamics is developed. A sequential numerical algorithm is defined which obtains output feedback gains minimizing a broad class of performance indices, including the standard LQ case. A procedure for optimally zeroing selected gain elements in an output feedback gain matrix is developed and demonstrated. A summary of conference and journal publications from this research is also provided. M.A.C.

N84-33072# Aeronautical Research Labs., Melbourne (Australia).
FLIGHT SYSTEMS RASTER GRAPHICS SOFTWARE REFERENCE MANUAL
Lewis N. Lester Jul. 1984 57 p ref
(ARL-SYS-TM-72; AR-003-939) Avail: NTIS HC A04/MF A01

Flight simulation work at Aeronautical Research Laboratories employs raster graphics for both the presentation of visual scenes with limited dynamic content and for the replication of both flight instruments and sensor displays. The raster graphics system consists of an LSI-11/23 microprocessor (functioning as host) and three A.R.L. designed controller units coupled to RGBS monitors, and is connected through the LSI-11/23 to the Flight Simulation Group VAX-11/780 computer. This Memorandum describes the raster graphic system, and four software packages which are available to enable a VAX user to create a manipulate pictures. These packages are: RJRLSI which runs in the LSI-11/23 for communication; LSILOAD, for loading and executing LSI programs; FLISGRAPH, a set of subroutines for creating and manipulating pictures; and MANPIX, a utility program which provides a versatile range of picture manipulation capabilities through a simple set of commands. Author

N84-33073# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE COMPRESSION OF DIGITAL IMAGERY BY TRANSFORMATION [COMPRESSAO DE IMAGENS DIGITAIS POR TRANSFORMACAO]
Ubirajara M. B. Lima Sep. 1983 92 p refs IN PORTUGUESE; ENGLISH summary Presented at the 35th Reuniao Anual da SBPC, 6 - 13 Jul. 1983, Belem, Paraguay Original doc. contains color illustrations
(INPE-2893-PRE/412) Avail: NTIS HC A05/MF A01

One of the greatest problems encountered in digital image processing is the large quantity of data involved. Techniques for data reduction are briefly described and special emphasis is given to transformation methods. Author

N84-33074# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
QUANTITATIVE ANALYSIS OF SATELLITE INFRARED IMAGERY USING DIGITAL STORAGE EQUIPMENT [ANALYSIS QUANTITATIVA DE IMAGENES INFRARROJO DE SATELITE, UTILIZANDO UN EQUIPO DE MEMORIZACION DIGITALA]
Paolo Pio G. Camilli Dec. 1983 13 p refs Presented no Curso Seminario sobre Aplicacoes dos Sensores Remotes em Hidrometeorologia, 12-18 Jun. 1983, Bogota Submitted for publication
(INPE-2978-PRE/440) Avail: NTIS HC A02/MF A01

A technique for enhancement of digital images, using false colors and called bit plane slicing, is presented. This technique is realizable with simple digital electronic combinational circuits, and doesn't require a computer. When applied on infrared images, full color-temperature resolution is attainable, up to the original digital quantification limits of data. An example of its usefulness can be verified on the equipment called UAI for Image Storage and Analysis Unit developed by the author in the Space Research Institute - INPE of Brazil. Author

N84-33075# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE USE OF PIPELINE TECHNIQUES IN THE ARCHITECTURE OF DIGITAL PROCESSORS EMPLOYED IN REAL TIME APPLICATIONS M.S. Thesis - 22 Aug. 1983 [USO DE TECNICAS DE ENCADEAMENTO NA ARQUITETURA DE PROCESSADORES DIGITAIS DEDICADOS A APLICACOES EM TEMPO REAL]

Almir Cavalcanti Lemos Filho Jan. 1984 128 p refs In PORTUGUESE; ENGLISH summary

(INPE-2992-TDL/153) Avail: NTIS HC A07/MF A01

The efficient use of statically configured pipelines is examined as an alternative to insert parallelism in a digital processor architecture. An implementation methodology of processors with this type of architecture is developed. To exemplify the application of the developed methodology an image radiometric equalizer and a 64 states Viterbi decoder are used. M.A.C.

N84-33076*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

COMPUTER VISION FOR REAL-TIME ORBITAL OPERATIONS. CENTER DIRECTORS DISCRETIONARY FUND Final Report

Frank L. Vinz, Linda L. Brewster, and L. Dale Thomas Aug. 1984 41 p refs

(NASA-TM-86457; NAS 1.15:86457) Avail: NTIS HC A03/MF A01 CSCL 09B

Machine vision research is examined as it relates to the NASA Space Station program and its associated Orbital Maneuvering Vehicle (OMV). Initial operation of OMV for orbital assembly, docking, and servicing are manually controlled from the ground by means of an on board TV camera. These orbital operations may be accomplished autonomously by machine vision techniques which use the TV camera as a sensing device. Classical machine vision techniques are described. An alternate method is developed and described which employs a syntactic pattern recognition scheme. It has the potential for substantial reduction of computing and data storage requirements in comparison to the Two-Dimensional Fast Fourier Transform (2D FFT) image analysis. The method embodies powerful heuristic pattern recognition capability by identifying image shapes such as elongation, symmetry, number of appendages, and the relative length of appendages. M.A.C.

N84-33077# Massachusetts Inst. of Tech., Cambridge.

EXTENDING BINARY BYZANTINE AGREEMENT TO MULTIVALUED BYZANTINE AGREEMENT Interim Research Report

B. A. Coan and R. Turpin (Information Research Associates) Apr. 1984 10 p

(Contracts N00014-82-K-0154; DAAG29-79-C-0155; Grants NSF MCS-81-16678; NSF MCS-83-02391; NSF MCS-83-06854)

(AD-A143424; MIT/LCS/TR-315) Avail: NTIS HC A02/MF A01 CSCL 09/2

A binary Byzantine agreement algorithm can be extended to produce a multivalued Byzantine agreement algorithm. The resulting multivalued algorithm is cheaper than previously published algorithms when the cost of transmitting values from the multivalued domain is significant. The concern of this paper is a set of potentially faulty processes that engage in a distributed computation to agree on some piece of information. Each process enters the computation with an initial value. The computation returns a common result value to each correct process. If all correct processes begin the computation with identical initial values, then the result equals the initial value. GRA

N84-33078# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Sciences.

HIGH-LEVEL OPERATIONS IN NONPROCEDURAL PROGRAMMING LANGUAGES

W. H. Liu Dec. 1983 243 p

(Contract N00014-83-K-0560)

(AD-A143470) Avail: NTIS HC A11/MF A01 CSCL 09/2

Despite having many advantages, nonprocedural programming languages have limited acceptance because of the inefficiencies of their implementations, especially for high-level operations. This dissertation presents a source-to-source transformation approach for efficient implementation of high-level operations in nonprocedural programming languages. Efficiency is achieved via decomposing the high-level operations into sets of basic ones prior to their being translated into the underlying graph representation. Global optimization hence becomes possible through source language manipulation, scheduling program events, and code generation. The specific contributions of the research include: (1) A source-to-source transformation scheme for efficient implementation of high-level operations, (2) Operations are made more powerful by allowing more generally structured operands, (3) Special indexing patterns are identified and uses for the application of efficient storage allocation schemes, (4) New building blocks for the underlying array graph are suggested and (5) The expressive power of the MODEL language is increased substantially through the incorporation of high-level operations. GRA

N84-33079# Maryland Univ., College Park. Computer Vision Lab.

DYNAMIC PROGRAMMING AND TRANSITIVE CLOSURE ON LINEAR PIPELINES

I. V. Ramakrishnan and P. J. Varman (Rice Univ.) May 1984 33 p

(Contract F49620-83-C-0082)

(AD-A143527; CAR-TR-57; CS-TR-1388; AFOSR-84-0559TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Algorithms for the dynamic programming and transitive closure problems are presented for a linear pipeline of processors. These algorithms require only a constant number of input/output ports and are optimal in their area and time requirements.

Author (GRA)

N84-33080# California Univ., Los Angeles. Dept. of Computer Science.

PROGRAMMING PRODUCTIVITY ENHANCEMENT BY THE USE OF APPLICATION GENERATORS Interim Report, 1 Jun. 1983 - 31 May 1984

E. Horowitz Jun. 1984 5 p

(Grant AF-AFOSR-0232-82)

(AD-A143532; AFOSR-84-0575TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

During this period, the investigators have focused on how to increase the power of programming languages for building man-computer dialogues. More specifically they see such dialogues in terms of a network of screens that might potentially be communicated to the end user. Different screens of data are shown depending on user responses. A programming language must make it easy to specify a network of such screens, describe the layout of any particular screen, and provide editing capabilities, validity checking of inputs, and scrolling capabilities. Author (GRA)

N84-33081# Maryland Univ., College Park. Dept. of Computer Science.

A THEORY OF ERROR-BASED TESTING

L. J. Morell Apr. 1984 88 p

(Contract F49620-83-K-0018)

(AD-A143533; TR-1395; AFOSR-84-0563TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

Testing is the process of inferring the correctness of a program based on information collected during program execution. This process is called error-based when the information collected is used to infer that certain errors are not in a program. It is assumed here that a program can only be incorrect in a limited fashion specified by associating alternate expressions with program expressions. Substitution of an alternate expression for a program expression yields an alternate program that is potentially correct. The goal of error-based testing is to differentiate the program from each of its alternates. Two types of error-based testing are given. In static error-based testing the code is analyzed to produce two conditions. A creation condition describes when a class of alternate expressions will affect the program state. A propagation condition describes when an alternate program state will affect the output. If the output of the program is correct and both conditions are satisfied, all alternatives are faults detected by the test set. In dynamic error-based testing information is first

collected from test executions. It is then proved that certain alternate programs are eliminated. A particular form of dynamic error-based testing based on symbolic execution is presented. In symbolic testing program expressions are replaced by symbolic alternatives that represent classes of alternate expressions. GRA

N84-33082# Softech, Inc., Waltham, Mass.
ADA (TRADEMARK) TRAINING CURRICULUM. PROGRAMMING METHODOLOGY m203 TEACHER'S GUIDE
Jul. 1984 578 p
(Contract DAAB07-83-C-K514)
(AD-A143581) Avail: NTIS HC A25/MF A01 CSCL 05/9

Partial Contents: Review of Software Life Cycle; Coding Phase; Goals; Structured Programming; Control Structures; Coding Style; and Ensuring Reliability. GRA

N84-33083# Softech, Inc., Waltham, Mass.
ADA (TRADEMARK) TRAINING CURRICULUM. BASIC ADA PROGRAMMING L202 TEACHER'S GUIDE, VOLUME 1
May 1984 743 p 2 Vol.
(Contract DAAB07-83-C-K514)
(AD-A143584) Avail: NTIS HC A99/MF A01 CSCL 05/9

This course consists of the following Modules: Introduction of Software Engineering; ADA Technical Overview; APSE Overview; Basic ADA Programming; and Programming Methodology. This course teaches a working subset of the ADA Language. Its intended audience is beginning ADA programmers with little experience with ADA. However this course does require the student to have working knowledge of at least one high order programming language. The course presents the fundamental concepts of the language. This course does not attempt to teach the full ADA Language. GRA

N84-33084# Softech, Inc., Waltham, Mass.
ADA (TRADEMARK) TRAINING CURRICULUM. BASIC ADA PROGRAMMING L202 TEACHER'S GUIDE, VOLUME 2
May 1984 373 p 2 Vol.
(Contract DAAB07-83-C-K514)
(AD-A143585) Avail: NTIS HC A16/MF A01 CSCL 05/9

The objective of section 10 is to review and formalize program structure, introduce formal and actual parameters, and introduce the concept of separate compilation. The objective of section 11 is to introduce the concept of scope and visibility and to introduce the student to various ADA constructs that he/she may encounter in using library units. The objective of section 12 is to introduce exceptions, exception handling, and the block statement. The objective of section 13 is to introduce the I/O operations available in ADA. Emphasis is placed on text-IO. The purpose of section 14 is to provide a reading knowledge of some of the more advance features of the language. It does not attempt to teach these concepts. They will be covered in later courses. GRA

N84-33085# Sandia Labs., Albuquerque, N. Mex.
SOLVING LOW DENSITY KNAPSACKS
E. F. Brickell 1984 14 p refs Presented at Crypto 1983 Conf., Santa Barbara, Calif., 22 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-006964; SAND-83-2496C; CONF-840830-1) Avail: NTIS HC A02/MF A01

Two methods for solving knapsacks (subset sum) of low density are described. Method 1 is a technique for solving knapsack problems that appears to work for almost all knapsacks of density less than 1/log2n. Method 2 is a slightly different technique that works on almost all knapsacks of density less than d(n), where d(n) is a function of n that is significantly larger than 1/log2n. However, estimates of d(n) come from empirical studies. DOE

N84-33086# Texas Univ., Austin. Dept. of Computer Sciences.
THE EFFECT OF QUEUEING DISCIPLINES ON RESPONSE TIMES IN DISTRIBUTED SYSTEMS
Elizabeth Williams 1984 4 p refs Presented at the Intern. Conf. on Parallel Process., Bellaire, Mich., 21-24 Aug. 1984
(Contract W-7405-eng-36)
(DE84-012639; LA-UR-84-1561; CONF-840869-1A) Avail: NTIS HC A02/MF A01

A distributed program consists of processes, many of which can execute concurrently on different processors in a distributed system of processors. When several processes from the same or different distributed programs have been assigned to a processor in a distributed system, the processor must select the next process to run. The question investigated is: What is an appropriate method for selecting the next process to run. Standard processor queueing disciplines, such as first-come-first-serve and round-robin-fixed-quantum, are studied. The results for four classes of queueing disciplines tested on three problems are presented. These problems were run on a testbed, consisting of a compiler and simulator used to run distributed programs on user-specified architectures. DOE

N84-33087# Illinois Univ., Urbana. Dept. of Computer Science.
HIGHER LAYER PROTOCOLS FOR A WORKSTATION ARCHITECTURE Ph.D. Thesis
Alfred D. Whaley May 1984 223 p refs
(Contract DE-AC02-76ER-02383; Grant NSF MCS-81-05896)
(DE84-013649; UIUCDCS-R-84-1169; COO-2383-0104; UILU-ENG-84-1719) Avail: NTIS HC A10/MF A01

WorkNet and the VSP (Virtual Service Protocol) are presented. WorkNet is an extension of transport layer protocols and interprocess communications mechanisms. VSP is a original presentation layer protocol. These protocols are tailored to workstations connected via a local area network. WorkNet is intended to integrate network and non-network I/O, to be flexible, and to allow connection of special purpose hardware indistinguishable from the inclusion of additional software packages. The integration of I/O makes WorkNet a reasonable basis for a message-based network operating system. The VSP provides a structured approach for characterizing and specifying the interface to complex processing functions at the presentation layer. At this layer, distributed processing is viewed as a collection of service modules that provide distinct services. The VSP aids in disseminating these services in a uniform manner throughout the network. DOE

N84-33088# Los Alamos Scientific Lab., N. Mex.
PROLONGING THE LIFE OF SOFTWARE
J. Connell and L. Brice 1984 30 p refs presented at Natl. Computer Conf., Las Vegas, Nev., 1 Jul. 1984
(Contract W-7405-eng-36)
(DE84-001722; LA-UR-83-3085) Avail: NTIS HC A03/MF A01

Presented here are methods for successfully controlling software maintenance activity so that present systems will be more useful and less expensive to support. While it is based on experience at Los Alamos National Laboratory, it is not based on solutions developed and implemented there. Los Alamos is presently struggling with the problems identified in this paper and is impacted by them to the same extent as the rest of industry. An idea has emerged from this struggle: the deterioration of production software is basically a quality control problem which can and should be solved. Many data processing shops currently have two options concerning old (over five years), marginally useful systems; pay the high cost of supporting them or undertake a rewrite. If the principles presented in this paper are applied, a third option may become available; prolonging the useful life of software by making it cost-effective to support. DOE

N84-33089# Oak Ridge National Lab., Tenn. Energy Div.
ALGORITHMS FOR ERROR LOCALIZATION OF DISCRETE DATA
G. E. Liepins Jul. 1984 53 p refs
(Contract DE-AC05-84OR-21400)
(DE84-014417; ORNL/TM-8183) Avail: NTIS HC A04/MF A01

A self-contained derivation and evaluation of the three principal algorithms for error localization of discrete data are provided: (1) generation of a sufficient set of edits by single-sweep with fathoming (suggested by the original work by Fellegi and Holt); and (2) sequential row generation (developed by Garfinkel); and (3) modifications of the Chernikova algorithm (suggested by

work of Rubin and Sande). The first two approaches can be characterized as Boolean-based, whereas the last is a nonpivoting extremal ray search. The background to the Boolean approaches to data editing is provided, as are Burger's results on extremal rays, Chernikova's original algorithm, and Rubin's modifications. For selected results, new elementary proofs are given in the appendix. For the Chernikova algorithm, novel use is made of the problem structure of localization to minimize the undesirable tendency to generate excessively large matrices. DOE

N84-33090# Pacific Northwest Lab., Richland, Wash.
BASIC GEOMETRIC ALGORITHMS FOR USE WITH GRAPHIC INPUT
R. J. Littlefield May 1984 11 p refs Presented at the 5th Ann. Conf. and Exposition of the Natl. Computer Graphics Assoc., Anaheim, Calif., 15 May 1984
(Contract DE-AC06-76RL-01830)
(DE84-013256; PNL-SA-12161; CONF-8405194-1) Avail: NTIS HC A02/MF A01

When a user positions the cursor on the screen of a graphics terminal, it is usually easy for a program to obtain the coordinates. Translating those into useful action is harder. Often, the program must find the data point or line nearest to the cursor, or determine whether a point is inside some polygon. These geometric relationships seem simple, but algorithms for evaluating them often are not obvious. A collection of useful techniques is given. How they can be used to graphically control functions like identifying points, picking subsets, and zooming a plot is discussed. DOE

N84-33091# Stanford Univ., Calif. Dept. of Computer Science.
S-1 SOFTWARE DEVELOPMENT AND MAINTENANCE Final Report, 1 Oct. 1981 - 30 Sep. 1982
G. C. M. Wiederhold 29 Sep. 1983 12 p refs
(Contract W-7405-eng-48)
(DE84-013071; UCRL-15607) Avail: NTIS HC A02/MF A01

The U-Fort U-code generating FORTRAN compiler was enhanced. Specifically, the FORTRAN 78 error branch capacity is supported in READ, WRITE statements. LLL codes are needed to declare arrays of pointers. Pointer variables can now be combined with interger variables of the same size. Additions and subtractions between integers and pointer values yield pointer values. The Ugen Code generator was retargeted to the Mark 2A. Spucific tasks performed include: A coil save convention and the R memory type was added to Ugen. Ugen was converted from a Mark/Release heap managemet strategy to a new dispose strategy. Techniques to recognized and collapse code were added. Tools to simplify porting were developed. A command line scanner for all U code programs was written. The PASCAL/FORTRAN high level debugger was expanded to include access to source files, expanded breakpoint, variable tracing commands, and a command parser. A version changer, VERCH, was used to maintain the suite of programs. A program was written to ease transportation of separately compiled modules to Unix PASCAl. An interfacer that enforces compile time type checking was developed. The local optimizer is now being expanded to include global optimizations. S.B.

N84-33092# Stanford Univ., Calif. Systems Optimization Lab.
DUALITY IN INEXACT FRACTIONAL PROGRAMMING WITH SET-INCLUSIVE CONSTRAINTS
R. N. Kaul, S. Kaur, and V. Lyall Jun. 1984 18 p refs
(Contract DE-AT03-76ER-72018)
(DE84-023584; SU-SOL-84-3) Avail: NTIS HC A02/MF A01

The fractional programming problem with set inclusive constraints is extended by replacing every coefficient vector in the objective function with a convex set. A dual is formulated and well known duality results are established. A numerical example illustrates the dual strategy to obtain the value of the initial problem. DOE

N84-33093# Schneider (Jos.) Optische Werke A.G., Bad Kreuznach (West Germany). Hauptbereich Entwicklung.
GRAPHICAL ERROR ANALYSIS Final Report, Aug. 1981
Rolf Keller and Wolfgang Schroeder Bonn Bundesministerium fuer Forschung und Technologie May 1984 105 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-081; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22

Tools for the design of optical systems were developed. Particular use was made of the generation of graphical representation via electronic calculation equipment. A program system that gives graphical information in addition to the alpha-numeric data as the result of optical calculations is developed. With the program system particular calculation data are used which are best shown in graphical form because of its great extent of expression. The application of the system permits improved insight into the physical coherence and gives clearer documentation in the case of optical design. Author (ESA)

N84-33094# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.
NORMAL MODES OF THE NCAR (NATIONAL CENTER FOR ATMOSPHERIC RESEARCH) COMMUNITY FORECAST MODEL (CFM)
James G. Vickroy, Jr. Apr. 1984 133 p refs Sponsored by NSF
(PB84-191220; NCAR/TN-232) Avail: NTIS HC A07/MF A01 CSCL 09B

The intent of this paper is to provide guidance in the use of various software tools archieves for the computation of equivalent depths, characteristic frequencies, and structure functions (both vertical and horizontal) for the NCAR global-atmospheric spectral model designated as CCMOB (Williamson, 1983). The above mentioned archives reside on the Large-scale Dynamics (LSD) IBM 4341 group virtual machine, and although it is not covered here, much of the archived software has a much wider applicability than the solution of normal mode problems. Of special interest here, instead, is the use of the depths, frequencies, and structure functions in a nonlinear normal mode initialization of CCMOB. Author (GRA)

N84-33095# Federal Compiler Testing Center, Falls Church, Va.
PROGRAMMER PRODUCTIVITY AID CATALOG
30 Sep. 1983 285 p
(PB84-212166; OSD/FSTC-83/017) Avail: NTIS HC A13/MF A01 CSCL 09B

The productivity aids that are included in this catalog address the system life cycle areas of design, development (code and application generation), testing, maintenance, documentation, and project management. A single aid may have application, and project management. A single aid may have application only one phase of the life cycle or may be used in several phases. The information contained herein is a result of a series of requests to vendors, both software and hardware, regarding the availability to their productivity aids. These products have not been tested or validated by FSTC, but are presented as described in literature provided by their respective vendors. Author (GRA)

N84-32567# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
ON APPLICATIONS OF A SPECIFICATION AND DESCRIPTION LANGUAGE NESDEL TO COMMUNICATION PROTOCOLS
Kazushi Funada, Kaoru Takahashi, Norio Shiratori, and Shoichi Noguchi *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 53, No. 1, Jul. 1984 Jul. 1984 p 15-28 refs In JAPANESE; ENGLISH summary (For primary document see N84-32565 22-31)
Avail: NTIS HC A03/MF A01

N84-32568# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
AN AUTOMATIC SYNTHESES OF HARDWARE ALGORITHM
Masahiro Aono, Lomton Paisan, Masateru Harao, and Shoichi Noguchi *In its* The Record of Elec. and Commun. Eng. Conversaz-

ione, Vol. 53, No. 1, Jul. 1984 Jul. 1984 p 29-46 refs In JAPANESE; ENGLISH summary (For primary document see N84-32565 22-31)
Avail: NTIS HC A03/MF A01

N84-32630*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE SIMULATION FOR UNIT-MEMORY CONVOLUTIONAL CODES WITH BYTE-ORIENTED VITERBI DECODING ALGORITHM
Q. D. Vo *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 99-107 ref (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09B

N84-32633*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ERROR-TRELLIS SYNDROME DECODING TECHNIQUES FOR CONVOLUTIONAL CODES
I. S. Reed (Univ. of Southern Calif.) and T. K. Truong *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 122-134 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N84-33096 Harvard Univ., Cambridge, Mass.
THEORETICAL ISSUES IN THE DESIGN AND VERIFICATION OF DISTRIBUTED SYSTEMS Ph.D. Thesis
Aravinda Sistla 1983 156 p
Avail: Univ. Microfilms Order No. DA8403047

With the rapid decrease in the cost of hardware distributed computing is finding wider application. The parallelism inherent in distributed processing makes it much more difficult to design reliable systems. Many software development techniques such as hierarchical design and exhaustive testing used for large sequential programs are no longer adequate because of the high degree of nondeterminism present in parallelism. This thesis addresses the two aspects of correctness and performance in the design of distributed and concurrent systems. In chapters 2 through 5 different temporal logics and their extensions are considered as formal systems for reasoning about concurrent programs in chapter 2 the complexity of decision procedures is investigated for different versions of Propositional Linear Temporal Logics (PTL). A space efficient decision procedure for the full logic is presented. Optimal decision procedures for other restricted versions of this logic are also presented. The problem of automatic verification of simple concurrent programs using correctness specifications given in PTL is investigated. Dissert. Abstr.

N84-33097*# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
SYSTEM ANALYSIS FOR THE HUNTSVILLE OPERATIONAL SUPPORT CENTER DISTRIBUTED COMPUTER SYSTEM Annual Report
F. M. Ingels and J. Mauldin Jul. 1984 126 p refs
(Contract NAS8-34906)
(NASA-CR-171136; NAS 1.26:171136; MSSU-EIRS-EE-83-6) Avail: NTIS HC A07/MF A01 CSCL 09B

The Huntsville Operations Support Center (HOSC) is a distributed computer system used to provide real time data acquisition, analysis and display during NASA space missions and to perform simulation and study activities during non-mission times. The primary purpose is to provide a HOSC system simulation model that is used to investigate the effects of various HOSC system configurations. Such a model would be valuable in planning the future growth of HOSC and in ascertaining the effects of data rate variations, update table broadcasting and smart display terminal data requirements on the HOSC HYPERchannel network system. A simulation model was developed in PASCAL and results of the simulation model for various system configuraions were obtained. A tutorial of the model is presented and the results of simulation runs are presented. Some very high data rate situations were simulated to observe the effects of the HYPERchannel switch over from contention to priority mode under high channel loading.
Author

N84-33098# Maryland Univ., College Park. Computer Vision Lab.
SIMULATION OF LARGE NETWORKS OF PROCESSORS BY SMALLER ONES
S. K. Bhaskar, A. Rosenfeld, and A. Y. Wu (American Univ.) May 1984 24 p
(Contract F49620-83-C-0082)
(AD-A143529; CAR-TR-63; CS-TR-1401; AFOSR-84-0558TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper considers the problem of simulating a large network N of processors using a small set of p processors. The approach taken is to partition the nodes of N into p subsets N sub 1 N sub P and to assign each subset to a processor for simulation. In order to equalize the workloads of the processors, the sizes of N sub 1, N sub P should be as equal as possible; and in order to minimize (and equalize) the amount of message passing between the processors, the number of pairs of nodes that are neighbors in N but belong to different subsets should be as small (and as equal) as possible. The authors discuss the general problem of partitioning a graph N so as to satisfy these criteria, and also consider the particular case of partitioning a tree. Author (GRA)

N84-33099# California Univ., Livermore. Lawrence Livermore Lab. Technology Information System.
AN ONLINE DIRECTORY OF DATABASES FOR MATERIAL PROPERTIES
Viktor E. Hampel, William A. Bollinger, Carol A. Gaynor (Control Data Corp.), and James J. Oldani May 1984 122 p refs Presented at the 9th Intern. CODATA Conf., Jerusalem, 24-28 Jun. 1984
(Contract W-7405-eng-48)
(DE84-013210; UCRL-90276; CONF-8406139-1) Avail: NTIS HC A06/MF A01

An online directory of databases of material properties on the Technology Information System at Lawrence Livermore National Laboratory (LLNL/TIS) is described. This directory is intended to provide interactive access to scientific and technical databases available to the public that contain information pertaining to nuclear, atomic, molecular, physical, chemical, and mechanical properties of substances. In addition to the 101 data files previously are reported. The information is updated with more than 38 numeric databases and predictive systems in these fields. In addition to describing the contents of the databases, updated information is provided on the availability of the databases and their online access over public telephone and data networks. Some of the numeric databases are directly accessible by authorized users via the TIS Intelligent Gateway Processor at LLNL (TIS/IGP), with self-guiding procedures for the downloading, merging, post-processing, and graphical/statistical analysis of data. DOE

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N84-33100# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CONTROLLER TECHNIQUE OF COMPENSATION FIGURED IN AN ACTIVE CONTROL SCHEME ON THE ACCUMULATED EFFECTS OF DEVIATION IN THE MODELING Ph.D. Thesis [CONTROLADOR COM TECNICA DE COMPENSACAO BASEADA EM UM ESQUEMA DE CONTROLE ATIVO SOBRE O EFEITO ACUMULADO DO DESVIO DA MODELAGEM]

Decio Castilho Ceballos Dec. 1983 84 p refs In PORTUGUESE; ENGLISH summary
(INPE-2987-TDL/152) Avail: NTIS HC A05/MF A01

The techniques developed for compensation of lack of fidelity in modelling normally act on the phenomenon of filter divergence. There is a gap of techniques which act in the filter and controller in a way to globally compensate the restricted fidelity in modelling. The accumulated effect of deviation is nullified in the modelling by using a correction in the control, such as to induce the physical system to have a behavior close to the model of work used in the synthesis and the implementation of the control. This effect is estimated using the concept of divergence in the filter of the state estimator. The procedure is applied to the attitude control of one of the axes of a satellite with flexible appendages whose physical model is approximated by a 14th order time invariant system. For the filter and controller synthesis a working model of order two is used corresponding to the rigid body motion. The results obtained are excellent both in absolute sense and was compared with other procedures. M.A.C.

N84-33101# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STATIC METHODS IN THE DESIGN OF NONLINEAR AUTOMATIC CONTROL SYSTEMS
N. I. Andreyev, B. G. Dostupov, I. Y. Kazakov, Y. M. Kozlov, and V. T. Kochetkov 27 Jun. 1984 769 p Transl. into ENGLISH of the mono. "Statisticheskiye Metody v. Proyektirovanii Nelineynykh Sistem Avtomaticheskogo Upravleniya" Moscow, Mashinostroyeniye, 1970 p 1-407
(AD-A143297; FTD-ID(RS)T-1734-83) Avail: NTIS HC A99/MF A01 CSCL 12/1

An overview of statistical methods used in the design and analysis of nonlinear control systems is presented. The specific topics addressed include: calculation of control processes in nonlinear systems by the method of statistical linearization; analysis of random processes in nonlinear self-tuning systems; method of equivalent perturbations; interpolation method of anayzing the accuracy of nonlinear automatic control systems; optimum self-tuning control systems; synthesis of automatic information-carrying systems with nonlinear filters; and special features of the application of digital computers in statistic studies of nonlinear systems. M.G.

N84-33102# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
FEEDBACK SYSTEMS AND SIMULTANEOUS DESIGN Final Scientific Report, 1 Mar. 1981 - 15 Jul. 1983
R. Saeks Jul. 1983 22018 p
(Grant AF-AFOSR-0113-82)
(AD-A143547; AFOSR-84-0570TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A family of analytic design techniques which can serve as a basis for a frequency domain approach to the computer-aided control system design problem are being developed. Specific projects include the development of multivariate frequency domain pole placement techniques, the formulation of techniques for incorporating domain pole placement techniques, the formulation of techniques for incorporating initial value constraints into the design problem, the extension of the theory of linear time-varying systems, and the development of simultaneous design algorithms. Author (GRA)

N84-33103# Maryland Univ., College Park.
FREQUENCY RESPONSE DESIGN METHODS FOR LARGE SCALE SYSTEMS
May 1984 80 p refs
(Contract DE-AC01-80RA-50420)
(DE84-013111; DOE/RA-50420/1) Avail: NTIS HC A05/MF A01

The basic idea behind this project was to extend the existing techniques for the design of multivariable control systems in two ways. For linear systems, where the computer aided design of multivariable control systems is relatively well established, the emphasis was on techniques to extend these methods so they could be applied to the decentralized control of large scale systems. For nonlinear systems, where the design of control systems is still very poorly understood, the emphasis has been on both specially structured large nonlinear systems where design results can be obtained and on extensions of techniques from the design of controllers for linear systems. A design method was produced that extends all of the techniques for computer aided design of linear multivariable control systems to large scale systems. Lie algebraic methods were used to develop observers and canonical forms for classes of nonlinear systems. Procedures were also developed for avoiding transmission zeroes of multivariable plants by means of modulating the controller signals. All of these results, and others, are briefly described in this report. DOE

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-33104 British Library Lending Div., Boston Spa (England).
ASSESSMENT OF TRENDS OF INPUT ACTIONS OF INERTIAL OBJECTS
V. P. Avdeev, S. R. Zeltser, L. P. Myshlyaev, L. T. Krivolapova, and Yu. N. Marchenko 19 Jun. 1984 9 p refs Transl. into ENGLISH from Izv. (USSR) p 122-126
(BLL-M-35689-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The problem of assessing process trends was considered as the object of systems investigations. This was done in close mutual relation with the dynamic characteristics of the controlled objects and the externally set aims of and constraints on the use of the assessments. In multi-purpose and non-stationary situations it is useful to use layered-structure multi-variant procedures for treating data time series. Author

N84-33105*# Mississippi State Univ., Mississippi State.
QUASICONFORMAL MAPPINGS AND GRID GENERATION
C. W. Mastin and J. F. Thompson [1983] 13 p refs Submitted for publication
(Grant NsG-1577)
(NASA-CR-173920; NAs 1.26:173920) Avail: NTIS HC A02/MF A01 CSCL 12A

A finite difference scheme is developed for constructing quasiconformal mappings for arbitrary simply and doubly connected regions. Computational grids are generated to reduce elliptic equations to canonical form. Examples of conformal mappings on surfaces are also included. Author

N84-33106*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SECOND- AND THIRD-ORDER UPWIND DIFFERENCE SCHEMES FOR HYPERBOLIC CONSERVATION LAWS
Jaw-Yen Yang Jul. 1984 50 p refs
(NASA-TM-85959; A-9752; NAS 1.15:85959) Avail: NTIS HC A03/MF A01 CSCL 12A

Second- and third-order two time-level five-point explicit upwind-difference schemes are described for the numerical solution of hyperbolic systems of conservation laws and applied to the Euler equations of inviscid gas dynamics. Nonliner smoothing techniques are used to make the schemes total variation diminishing. In the method both hyperbolicity and conservation properties of the hyperbolic conservation laws are combined in a very natural way by introducing a normalized Jacobian matrix of the hyperbolic system. Entropy satisfying shock transition operators which are consistent with the upwind differencing are locally introduced when transonic shock transition is detected. Schemes thus constructed are suitable for shockcapturing calculations. The stability and the global order of accuracy of the proposed schemes are examined. Numerical experiments for the inviscid Burgers equation and the compressible Euler equations in one and two

space dimensions involving various situations of aerodynamic interest are included and compared. R.J.F.

N84-33107*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PARAMETER ESTIMATION FOR THE EULER-BERNOULLI-BEAM Final Report
E. Graif and K. Kunisch Jun. 1984 45 p refs
(NASA-CR-172417; ICASE-84-22; NAS 1.26:172417) Avail: NTIS HC A03/MF A01 CSCL 12A

An approximation involving cubic spline functions for parameter estimation problems in the Euler-Bernoulli-beam equation (phrased as an optimization problem with respect to the parameters) is described and convergence is proved. The resulting algorithm was implemented and several of the test examples are documented. It is observed that the use of penalty terms in the cost functional can improve the rate of convergence. Author

N84-33108*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EXPONENTIAL ACCURACY OF FOURIER AND TCHEBYSHEV DIFFERENCING METHODS Final Report
Eitan Tadmor (Tel-Aviv Univ.) Aug. 1984 26 p refs
(Contract NAS1-17070)
(NASA-CR-172435; ICASE-84-40; NAS 1.26:172435) Avail: NTIS HC A03/MF A01 CSCL 12A

It is shown that when differencing analytic functions using the pseudospectral Fourier or Tchebyshev methods, the error committed decays to zero at an exponential rate. Author

N84-33109# Tata Inst. of Fundamental Research, Bombay (India). School of Mathematics.
HARMONIC MAPS FROM S-2 TO IHP-2
A. R. Aithal 3 Aug. 1984 32 p refs
Avail: NTIS HC A03/MF A01

All harmonic maps from the Riemann 2 sphere to ihp(2), the quaternion 2 projective space, are described. All isotropic harmonic maps from s(2) to ihp(n) are given. Harmonic maps from s(2) to s(n) and s(2) to cp(n) are classified by Calabi, E[1] and Eells-Wood[2] respectively. M.A.C.

N84-33110# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ANALYTICAL SOLUATION FOR COMPUTING FIRST AND SECOND ORDER ORDINARY DIFFERENTIAL EQUATIONS USING A METHOD OF SERIES DEVELOPMENT [SOLUCAO ANALITICA POR COMPUTADORES DE EQUACOES DIFERENCIAIS ORDINARIAS DE PRIMEIRA E SEGUNDA ORDENS UTILIZANDO O METODO DE DESENVOLVIMENTO EM SERIES]
Guilherme Bittencourt and Luiz Alberto Vieira Dias Dec. 1983 19 p refs Presented at the 6th Congr. Nacl. de Mat. Apl. e Computacional, Sao Jose dos Campos, Brazil
(INPE-2980-PRE/442) Avail: NTIS HC A02/MF A01

Based on Reduce 2 symbolic manipulation capacities, a set of procedures was developed and implemented, in order to analytically solve differential equations. The input equation is written in the usual mathematical form, and if it is linear, the frovenius method is used, yielding a power series solution. The system may be interactive or on batch. Errors and/or follow-up massages are displayed, if necessary. This work complements an analytical ordinary differential equations solution by computer, using heuristic methods. Author

N84-33111*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON ACCURACY CONDITIONS FOR THE NUMERICAL COMPUTATION OF WAVES Final Report
Alvin Bayliss (Exxon Corporate Research), C. I. Goldstein (Brookhaven National Lab.), and E. Turkel (Tel-Aviv Univ.) Aug. 1984 19 p refs
(Contracts NAS1-17130; DE-AC02-76CH-00016)
(NASA-CR-172433; ICASE-84-38; NAS 1.26:172433) Avail: NTIS HC A02/MF A01 CSCL 12A

The Helmholtz equation (Delta + K(2)n(2))u = f with a variable index of refraction n, and a suitable radiation condition at infinity serves as a model for a wide variety of wave propagation problems. Such problems can be solved numerically by first truncating the given unbounded domain and imposing a suitable outgoing radiation condition on an artificial boundary and then solving the resulting problem on the bounded domain by direct discretization (for example, using a finite element method). In practical applications, the mesh size h and the wave number K, are not independent but are constrained by the accuracy of the desired computation. It will be shown that the number of points per wavelength, measured by (Kh)(-1), is not sufficient to determine the accuracy of a given discretization. For example, the quantity K(3)h(2) is shown to determine the accuracy in the L(2) norm for a second-order discretization method applied to several propagation models. Author

N84-33112*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NUMERICAL SOLUTIONS OF ACOUSTIC WAVE PROPAGATION PROBLEMS USING EULER COMPUTATIONS Final Report
S. Hariharan (Tennessee Univ. Space Inst.) Aug. 1984 31 p refs
(Contract NAS1-17070)
(NASA-CR-172434; ICASE-84-39; NAS 1.26:172434) Avail: NTIS HC A03/MF A01 CSCL 12A

This paper reports solution procedures for problems arising from the study of engine inlet wave propagation. The first problem is the study of sound waves radiated from cylindrical inlets. The second one is a quasi-one-dimensional problem to study the effect of nonlinearities and the third one is the study of nonlinearities in two dimensions. In all three problems Euler computations are done with a fourth-order explicit scheme. For the first problem results are shown in agreement with experimental data and for the second problem comparisons are made with an existing asymptotic theory. The third problem is part of an ongoing work and preliminary results are presented for this case. Author

N84-33113*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE TIME EVOLUTION OF SPECTRAL DISCRETIZATIONS OF HYPERBOLIC SYSTEMS Final Report
Liviu Lustman Aug. 1984 14 p refs
(Contracts NAS1-17261; NAS1-17070)
(NASA-CR-172432; NAS 1.26:172432; ICASE-84-37) Avail: NTIS HC A02/MF A01 CSCL 12A

A Chebyshev collocation spectral method, applied to hyperbolic systems is considered, particularly for those initial boundary value problems which possess only solutions tending to zero at large times. It is shown that the numerical solutions of the system will also vanish at infinity, if and only if, the numerical solution of a scalar equation of the same type does. This result is then generalized for other spectral approximations. Author

N84-33114# Naval Ocean Systems Center, San Diego, Calif.
THE LF'AST SQUARES LATTICE ALGORITHM: AN ALTERNATE DERIVATION WITH A DISCUSSION OF NUMERICAL CONDITIONING Final Technical Report, Nov. 1983 - Jan. 1984
S. Kalson Jan. 1984 46 p
(AD-A143439; NOSC/TR-950) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new derivation of the least squares lattice algorithm is given in which the filter coefficients are solved for directly by a Gram-Schmidt orthogonalization of the data. This approach shows that the unnormalized and normalized least squares lattice algorithms have the same numerical conditioning as the so-called normal equations associated with least squares problems. Thus, contrary to some of the literature, the normalized lattice is not numerically superior to the unnormalized lattice for ill-conditioned problems. Author (GRA)

N84-33115# Stanford Univ., Calif. Dept. of Statistics.
DISTRIBUTION RESULTS FOR POSITIVE DEFINITE QUADRATIC FORMS WITH REPEATED ROOTS
M. E. Bock 10 Jul. 1984 50 p
(Contract N00014-76-C-0475)
(AD-A143450; TR-347) Avail: NTIS HC A03/MF A01 CSCL 12/1

The distribution of a statistic which is a positive linear combination of independent chi-square random variables is evaluated in certain cases where some of the degrees of freedom are larger than one. Such statistics arise in positive definite quadratic forms of normal random vectors and as the trace of a Wishart matrix. They also arise in the asymptotic distribution for chi-squared goodness-of-fit tests with estimated parameters and for the average Kendall tau statistic. Author (GRA)

N84-33116# Illinois Univ., Urbana. Model Based Measurement Lab.
DISTRIBUTIONS OF CENTRAL QUADRATIC FORMS IN NORMAL VARIABLES: A COMPARISON OF ALGORITHMS
B. Williams Jun. 1984 67 p
(Contracts N00014-79-C-0752; N00014-83-K-0397; RR0-4204)
(AD-A143468; Measurement-Ser-84-3) Avail: NTIS HC A04/MF A01 CSCL 12/1

Quadratic functions of multivariate normal random variables arise with surprising frequency in certain social science theories. However, these seem to be rarely used in applications because of the numerical difficulties in computing their distribution function for an arbitrary positive definite quadratic form in multivariate normal variables. Alternative algorithms are reviewed. Comparison trials are reported to show that the new algorithm is at least a accurate and reliable as the alternative algorithms. Author (GRA)

N84-33117# Brown Univ., Providence, R. I. Center for Dynamical Systems.
SYMBOLIC DYNAMICS AND NONLINEAR SEMIFLOWS
J. K. Hale and X. B. Lin May 1984 49 p
(Contract DAAG29-83-K-0029; Grants AF-AFOSR-0198-81; NSF MCS-82-05355)
(AD-A143487; LCDS-84-8; AFOSR-84-0568TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

For a transverse homoclinic orbit gamma of a mappoint (not necessarily invertible) on a Banach space, it is shown that the mapping restricted to orbits near gamma is equivalent to the shift automorphism on doubly infinite sequences of finitely many symbols. Implications of this result for the Poincare map of semiflows are given. Author (GRA)

N84-33118# Maryland Univ., College Park. Computer Vision Lab.
DEGREES OF ADJACENCY OR SURROUNDEDNESS
A. Rosenfeld and R. Klette Mar. 1984 33 p
(Contract F49620-83-C-0082)
(AD-A143528; CAR-TR-53; CS-TR-1380; AFOSR-84-0560TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Definitions of the degree of adjacency of two regions in the plane, and the degree of surroundedness of one region by another, are proposed. Some elementary properties of these concepts are established, and it is also shown that they have natural generalizations to fuzzy subsets of the plane. Applications of the proposed measures to digital polygons are demonstrated and fast algorithms for computing these measures are given. Author (GRA)

N84-33119# California Univ., Santa Barbara.
STABILITY ANALYSIS OF FINITE DIFFERENCE SCHEMES FOR HYPERBOLIC SYSTEMS, AND PROBLEMS IN APPLIED AND COMPUTATIONAL LINEAR ALGEBRA Interim Report, 1 May 1983 - 30 Apr. 1984
M. Marcus and M. Goldberg 22 Jun. 1984 23 p
(Grant AF-AFOSR-0150-83)
(AD-A143537; AFOSR-84-0567TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The described efforts consist of the following projects: (1) Problems in stability analysis of finite difference approximations for hyperbolic initial-boundary value problems; (2) Matrix norms, condition numbers and the numerical solution of linear systems, and numerical range approximations. Such projects should contribute to better understanding of advanced computational techniques, and to the improvement of basic mathematical tools often used in numerical analysis and other fields of applied mathematics. GRA

N84-33120# Maryland Univ., College Park.
PERSISTENCE OF THE HOPF BIFURCATION UNDER SINGULAR PERTURBATIONS
E. H. Abed 7 May 1984 4 p refs Presented at Intern. Symp. on Circuits and Systems: ISCAS, 1984, Montreal, 7 May 1984
(Contract DE-AC01-82CE-762221)
(DE84-013871; CONF-840576-5) Avail: NTIS HC A02/MF A01

Persistence of the Hopf bifurcation under singular perturbations of the associated vector field was studied. Both single parameter and multiparameter singular perturbation problems are considered. In each case, hyperbolicity of an associated fast time system is shown to imply persistence. For single parameter singular perturbation problems, Fenichel's center manifold theorem for singularly perturbed systems was employed to prove regular degeneration of the bifurcated periodic solutions and to study their stability. DOE

N84-33121# Ecole Polytechnique, Palaiseau (France).
NUMERICAL DIFFRACTION BY A UNIFORM GRID
A. Bamberger, J. C. Guillot, and P. Joly 1984 164 p refs Transl. into ENGLISH of Rept. BNL-tr-1031 Centre de Math. Appl., France
(Contract DE-AC02-76CH-00016)
(DE84-012861; BNL-tr-1031) Avail: NTIS HC A08/MF A01

The influence of a spatial discretization on the propagation of a wave generated by a harmonic point source is analyzed. Finite element and finite difference schemes on a uniform grid for the wave equation are considered. The asymptotic behavior in space of the elementary solution of the associated Helmholtz equation is studied. The shape of the wave fronts and at the distribution of the amplitude along these fronts are measured as function of the wave number and the mesh size. Results which complement those that have been obtained by plane wave analysis are derived. Some of these results are classic in crystallography. The method of analysis is based on stationary phase techniques, commonly used in the theory of partial differential equations. DOE

N84-33122# Los Alamos Scientific Lab., N. Mex.
HIGH-ORDER SPARSE FACTORIZATION METHODS FOR ELLIPTIC BOUNDARY VALUE PROBLEMS
J. M. Hyman and T. A. Manteuffel 1984 6 p refs Presented at 5th IMACS Intern. Symp., Bethlehem, Pa., 19 Jun. 1984
(Contract W-7405-eng-36)
(DE84-012582; LA-UR-84-1717; CONF-8406113-3) Avail: NTIS HC A02/MF A01

The solution of sparse linear systems, $Av = b$, that arise from finite difference or finite element approximations to partial differential equations is addressed. Many iterative methods require solving an easier approximate equation, $Pv = b$, on each iteration. This is often called preconditioning or operator splitting (1,2,4,6-9, 12-14). The methods considered factor A approximately into the product of an upper and lower triangular matrix P is identical to LU approx. = A. These methods are called incomplete LU factorization methods and their convergence rate depends on how well P approximates A. Some new algorithms to generate accurate LU decompositions based on the continuity of the solution v are described. DOE

N84-33123# Sandia Labs., Albuquerque, N. Mex.
SOME PRACTICAL RUNGE-KUTTA FORMULAS
L. F. Shampine Apr. 1984 31 p refs
(Contract DE-AC04-76DP-00789)
(DE84-013539; SAND-84-0812) Avail: NTIS HC A03/MF A01

A new selection is made of the most practical of the many

explicit Runge-Kutta formulas of order 4 which have been proposed. A new formula is considered, formulas are modified to improve their quality and efficiency in agreement with improved understanding of the issues, and formulas are derived which permit interpolation. It is possible to do a lot better than the pair of Fehlberg currently regarded as best. DOE

N84-32631*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SIMPLE ALGORITHM FOR THE METRIC TRAVELING SALESMAN PROBLEM
M. J. Grimm *In its* The Telecommun. and Data Acquisition Rept. 15 Aug. 1984 p 108-114 refs (For primary document see N84-32622 22-32)
Avail: NTIS HC A11/MF A01 CSCL 12A

N84-33026# Paris-Sud Univ., Orsay (France). Dept. de Mathematiques.
THE FOURIER PLANCHEREL TRANSFORM FOR LIE GROUPS. 2: NILPOTENT GROUPS [LA TRANSFORMATION DE FOURIER-PLANCHEREL ANALYTIQUE DES GROUPES DE LIE. 2: LES GROUPES NILPOTENTS]
Nghiem Xuan Hai *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 1-37 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33027# Sarkaria (K. S.), Chandigarh (India).
NON-DEGENERESCENCE OF SOME SPECTRAL SEQUENCES
K. S. Sarkaria *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 39-46 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33028# North Carolina Univ., Chapel Hill. Dept. of Mathematics.
SUBGROUPS OF CONTINUOUS GROUPS ACTING DIFFERENTIABLY ON THE HALF-LINE
J. F. Plante *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 47-56 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33030# Hiroshima Univ. (Japan). Dept. of Mathematics.
ON THE BOUNDARY LIMITS OF HARMONIC FUNCTIONS WITH GRADIENT IN L SUP p
Yoshihiro Mizuta *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 99-109 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33031# Federation Nationale Researche Scientifique, Liege (Belgium). Inst. de Mathematiques.
WAVE FRONTS TO INFINITY OF REAL ANALYTIC FUNCTIONS [FRONTS D'ONDE A L'INFINI DES FONCTIONS ANALYTIQUES REELLES]
Jean-Louis Lieutenant *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 111-140 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33034# Grenoble-1 Univ. (France). Inst. Fourier.
SINGULARITIES CONNECTED WITH A TRACE ON A BANACH ALGEBRA [SINGULARITES ELIMINABLES POUR DES EQUATIONS SEMI-LINEAIRES]
P. Baras and M. Pierre *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 185-206 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33037# Nancy Univ. (France).
FATOU THEOREM FOR THE PROPER FUNCTIONS OF INVARIANT POTENTIAL OPERATORS BY A GROUP OF CARTAN DISPLACEMENTS [THEOREME DE FATOU POUR LES FONCTIONS PROPRES DES OPERATEURS DIFFERENTIELS INVARIANTS PAR UN GROUPE DE DEPLACEMENTS DE CARTAN]
Noureddine El-Jaouhari *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 261-270 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33039# Universite de Franche-Comte, Bresancon (France). Dept. de Sciences-Mathematiques.
INFINITESIMAL L-CLASSES OF A GROUP OF ALGEBRAIC NUMBERS [L-CLASSES INFINITESIMALES D'UN CORPS DE NOMBRES ALGEBRIQUES]
Jean-Francois Jaulent *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 1-27 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33041# Lyon-1 Univ. (France). Lab. d'Analyse Fonctionnelle.
CANONIC MEASUREMENTS IN THE CLASSIC MOMENT PROBLEM [MESURES CANONIQUES DANS LE PROBLEME CLASSIQUE DES MOMENTS]
H. Buchwalter and G. Cassier *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 45-52 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33045# Paris-Sud Univ., Orsay (France). Dept. de Mathematiques.
UNIQUENESS IN THE CAUCHY PROBLEM FOR SECOND ORDER OPERATORS WITH REAL SYMBOLS [UNICITE DU PROBLEME DE CAUCHY POUR DES OPERATEURS DU SECOND ORDRE A SYMBOLES REELS]
Serge Alinhac *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 89-109 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33047# Ghent Univ. (Belgium). Seminar of Higher Analysis.
COMPLETELY CONTINUOUS MULTIPLIERS FROM L SUB 1 (G) INTO L SUB INFINITY (G)
G. Crombez and W. Govaerts *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 137-154 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33051# Paris VI Univ. (France). Analyse Complexe et Geometrie.
BROWNIAN MOTION AND RANDOM WALKS ON MANIFOLDS
Nicolas Th. Varopoulos *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 243-269 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33052# Cambridge Univ. (England). Emmanuel Coll.
ALGORITHMIC INTEGRATION OF ELEMENTARY TRANSCENDENTAL FUNCTIONS ON AN ALGEBRAIC CURVE [INTEGRATION ALGORITHMIQUE DES FONCTIONS ELEMENTAIREMENT TRANSCENDANTES SUR UNE COURBE ALGEBRIQUE]
J. H. Davenport *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 271-276 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-33124# RAND Corp., Santa Monica, Calif.
USING STATISTICAL TOOLS

John E. Rolph Apr. 1984 77 p refs Presented at Private Sector Sponsors Program (PSSP) Process Indus. Workshop, 28-30 Sep. 1983
(RAND/N-2121-PSSP) Avail: NTIS HC A05/MF A01

The briefing presented here has two goals: to review the logic behind statistical reasoning, with particular emphasis on regression techniques; and to discuss, through a series of examples, how to interpret output from regression programs. The material is organized into three sections. The first discusses model building. The second describes how regression methods can be used to fit equations to data. The third describes how to make statistical inferences about the parameters that describe a regression line or surface, and discusses potential pitfalls in making such inferences. Author

N84-33125# Princeton Univ., N. J. Dept. of Statistics.
ROBUST C(ALPHA)-TYPE TESTS FOR LINEAR MODELS
E. Ronchetti Feb. 1984 11 p
(Contract DAAG29-82-K-0178)
(AD-A143177; TR-259-SER-2; ARO-19442.18-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

A new class of tests that can be viewed as a generalization of Neyman's optimal C(Alpha) test is introduced. An optimally robust test which maximizes the asymptotic power within this class, subject to a bounded influence function, is selected. It is shown that it is equivalent to a certain asymptotically minimax test proposed by Wang (1981). Finally, some numerical results on the asymptotic behavior of robust C(Alpha)-type tests under several errors' and carriers' distributions are discussed. Author (GRA)

N84-33126# Princeton Univ., N. J. Dept. of Statistics.
BOUNDED-INFLUENCE INFERENCE IN REGRESSION
E. Ronchetti Feb. 1984 40 p
(Contract DAAG29-82-K-0178)
(AD-A143195; TR-257-SER-2; ARO-19442.17-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two new classes of tests for regression models, likelihood ratio type tests based on quadratic forms of robust estimators, are introduced. Both can be viewed as generalization of the classical F-test. By means of the influence function their robustness properties are investigated and optimally robust tests that maximize the asymptotic power within each class, under the side condition of a bounded influence function, are constructed. Finally, an example based on real data shows that these tests are valuable robust alternatives to the F-test. Author (GRA)

N84-33127# Princeton Univ., N. J. Dept. of Statistics.
ROBUST MODEL SELECTION IN REGRESSION
Elvezio Ronchetti Feb. 1984 11 p
(Contract DAAG29-82-K-0178)
(AD-A143209; TR-259-SER-2; ARO-19442.19-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

A robust version of Akaike's model selection procedure for regression models is introduced and its relationship with robust testing procedures is discussed. Author (GRA)

N84-33128# Stanford Univ., Calif. Dept. of Statistics.
RELATIONSHIPS AMONG CLASSES OF SPHERICAL MATRIX DISTRIBUTIONS
Kai-Tai Fang (Academia Sinica, China) and Han-Feng Chen (Wuhan Univ., China) Apr. 1984 28 p
(Contract DAAG29-82-K-0156)
(AD-A143215; TR-10; ARO-19065.10-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

Several classes of spherical matrix distributions have been studied by many authors. In this paper the relationship among the classes are discussed in the following aspects: the characteristic functions in these classes, coordinate transformations, marginal distributions, marginal densities, and sphericity. Some statistics that are invariant in these classes are listed for applications.
Author (GRA)

N84-33129# Naval Research Lab., Washington, D. C.
ANGULAR RESOLUTION OF COHERENT AND NONCOHERENT SOURCES Interim Report
G. V. Trunk 14 Jun. 1984 17 p
(RR0-2105)
(AD-A143287; NRL-8827) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of resolving radiating sources in angle is formulated as a binary hypothesis test. A generalized likelihood ratio test is developed and positive results are obtained. Using simulation techniques, the probability of resolution was calculated for both coherent and noncoherent sources. Two 20-dB noncoherent Rayleigh fluctuating sources separated by 0.1 beamwidth can be resolved at a resolution probability of 0.9 and at a false-alarm rate of 0.01 by using samples from an 8-element array and 32 range cells. A one-term approximation to the generalized likelihood ratio, which is equivalent to the square error residue from fitting one source to the data, is only slightly less accurate than the likelihood approach. Author (GRA)

N84-33130# Stanford Univ., Calif. Dept. of Statistics.
VARIABILITY ORDERINGS RELATED TO COVERAGE PROBLEMS ON THE CIRCLE
F. Huffer 12 Jun. 1984 19 p
(Contract N00014-76-C-0475)
(AD-A143364; TR-346) Avail: NTIS HC A02/MF A01 CSCL 12/1

Suppose that n arcs with random lengths having distributions F1, F2, ...Fn are placed uniformly and independently on a circle. This article presents inequalities which tell how certain distributions and probabilities change as the variability of the distributions F1, F2, ...Fn is increased. A distribution F is considered to be more variable than G if integral $h(x)dF(x) > \text{or} = \text{integral } h(x)dG(x)$ for all convex functions h. Author (GRA)

N84-33131# Tennessee Technological Univ., Cookeville. Dept. of Mathematics.
ONE-SIDED R-RELIABLE INTERVALS AND THEIR ASSOCIATED CONFIDENCES ON THE SUM OF TWO CONTINUOUS/INDEPENDENT, RANDOM VARIABLES Final Report, 6 Jun. 1983 - 5 Jun. 1984
S. A. Patil Jun. 1984 31 p
(Grant AF-AFOSR-0250-83)
(AD-A143387; AFOSR-84-0561TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this proposal is to define and determine an R-reliable interval and its associated confidence on the sum of two continuous, independent, random variables with different scale parameters. The relationship between the confidence of the R-reliable interval on the sum and the confidences of the R-reliable intervals on the summand variables was also investigated. The confidence of the R-reliable interval on the sum was defined, and the largest order statistics were chosen which simplified the expression for the confidence of the R-reliable interval on the sum. The choice of the largest order statistics led to nonparametric results for the confidences of the R-reliable intervals on the summand variables. Exponential and folded normal continuous distributions were considered, and numerical values of the confidences associated with the R-reliable interval on the sum were obtained for selected sample sizes and selected ratios of the scale parameters. A distribution-free bound for the confidence of the R-reliable interval on the sum in terms of the confidence associated with the R-reliable intervals on the summand variables was obtained. The monotonicity of the confidence of the R-reliable interval on the sum was established for specific values of sample sizes. Author (GRA)

N84-33132# Florida State Univ., Tallahassee. Dept. of Statistics.
TP2 ORDERINGS
J. Lynch, G. Mimmack, and F. Proschan Mar. 1984 18 p
(Contracts DAAG29-82-K-0168; DAAG29-84-K-0007; Grant AF-AFOSR-82-K-0007)

(AD-A143434; FSU-STATISTICS-M678; AFOSR-83-168TR; ARO-19367.13-MA; ARO-20063.1-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Uniform stochastic orderings of random variables are expressed as total positivity of density, survival and distribution functions. The orderings are called uniform because each is a stochastic order that persists under conditioning to a family of intervals-for example, the family consisting of all intervals of the form (- infinity,x). This paper is concerned with the preservation of uniform stochastic ordering under convolution, mixing and the formation of coherent systems. A general TP2 result involving preservation of total positivity under integration is presented and applied to convolutions and mixtures, of distribution and survival functions. Logconcavity of distribution, survival and density functions characterizes random variables that preserve the various orderings under addition. Likewise, random variables that preserve orderings under mixing are characterized by TP2 distribution and survival functions. Author (GRA)

N84-33133# ALPHATECH, Inc., Burlington, Mass.
SENSOR CORRELATION AND DATA FUSION THEORY Final Report, 1 Apr. 1981 - 30 Jun. 1984
N. R. Sandell, Jr. Jun. 1984 104 p
(Contract F49620-81-C-0015)
(AD-A143587; TR-205; AFOSR-84-0577TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report contains a summary of the results of the first two years, and the results obtained during the third year of research in the mathematical problems associated with the analysis and design of Air Force sensor correlation and data fusion systems. These systems play a vital role in the command and control process, but presently there exists no systematic and quantitative methodology for their analysis and design. In the first year of research ALPHATECH investigated an important subproblem: the distributed detection problem associated with determining the presence or absence of targets from a collection of distributed sensors. In the second year of research, ALPHATECH obtained novel exact expressions for the probability density function of the local log likelihood ratios used in distributed detection problems, and has used these expressions to generate an extensive set of design curves. In the third year of research, ALPHATECH investigated another important class of problems, namely, sequential distributed detection problems. Three such problems were formulated: the infinite horizon decentralized Wald problem; a decentralized Quickset Detection problem; and a sequential distributed detection problem with communication and ordered stopping times. The qualitative properties of the optimal solution for the decentralized Wald and the decentralized Wald problem and the sequential distributed detection problem with communication were obtained. Author (GRA)

N84-33134# Sandia Labs., Albuquerque, N. Mex.
ASYMPTOTIC RELATIVE EFFICIENCIES OF THE RANK TRANSFORMATION PROCEDURE IN RANDOMIZED COMPLETE BLOCK DESIGNS
Stephen C. Hora and Ronald L. Iman 1984 24 p refs Presented at the Ann. Meeting of the Am. Statist. Assoc. (ASA), Philadelphia, 12 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-010600; SAND-84-0479C; CONF-840849-1) Avail: NTIS HC A02/MF A01

Rank tests provide an alternative to the usual normal theory F-test for the analysis of data from randomized complete blocks experiments. Two such rank tests are the Friedman test which employs the method of n-rankings and the rank transformation procedure which employs an overall ranking of the data. The asymptotic efficiency of the rank transformation procedure is developed and compared to the asymptotic efficiencies of Friedman's test and the usual F-test. These efficiencies are developed using contiguous alternatives that are shifts in location. Comparisons among the three tests are made using normal, Student, and double exponential within block distributions. Block effects are introduced by drawing location shifts from normal and uniform distributions and, also, by drawing scale changes from inverted gamma densities. The asymptotic relative efficiencies were evaluated using numerical procedures. DOE

N84-33135# Los Alamos Scientific Lab., N. Mex.
INVESTIGATION OF AN EMPIRICAL PROBABILITY MEASURE BASED TEST FOR MULTIVARIATE NORMALITY
J. M. Booker, M. E. Johnson, and R. J. Beckman 1984 33 p refs Presented at Ann. Meeting of the Am. Statist. Assoc. (ASA), Philadelphia, 12 Aug. 1984
(Contract W-7405-eng-26)
(DE84-012626; LA-UR-84-1499; CONF-840849-3) Avail: NTIS HC A03/MF A01

Foutz (1980) derived a goodness of fit test for a hypothesis specifying a continuous, p-variate distribution. The test statistic is both distribution-free and independent of p. In adapting the Foutz test for multivariate normality, using chi(2) and rescaled beta variates was considered in constructing statistically equivalent blocks. The Foutz test is compared to other multivariate normality tests developed by Hawkins (1981) and Malkovich and Afifi (1973). The set of alternative distributions tested include Pearson type II and type VII, Johnson translations, Plackett, and distributions arising from Khintchine's theorem. Univariate alternatives from the general class developed by Johnson et al., (1980) were also used. An empirical study confirms the independence of the test statistic on p even when parameters are estimated. In general, the Foutz test is less conservative under the null hypothesis but has poorer power under most alternatives than the other tests. DOE

N84-33136# Los Alamos Scientific Lab., N. Mex.
MONTE CARLO ESTIMATION UNDER DIFFERENT DISTRIBUTIONS USING THE SAME SIMULATION
R. J. Beckman and M. D. McKay 1984 24 p refs Presented at Ann. Meeting of the Am. Statist. Assoc. (ASA), Philadelphia, 12 Aug. 1984
(Contract W-7405-eng-36)
(DE84-012438; LA-UR-84-1583; CONF-840849-2) Avail: NTIS HC A02/MF A01

Two methods for reducing the computer time necessary to investigate changes in distribution of random inputs of large simulation computer codes are presented. The first method produces unbiased estimators of functions of the output variable under the new distribution of the inputs. The second method generates a subset of the original outputs which has a distribution corresponding to the new distribution of inputs. Efficiencies of the two methods are examined. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-33137# RAND Corp., Santa Monica, Calif.
RAND'S EXPERIENCE IN APPLYING ARTIFICIAL INTELLIGENCE TECHNIQUES TO STRATEGIC-LEVEL MILITARY-POLITICAL WAR GAMING
Paul K. Davis Apr. 1984 33 p refs Presented at the Summer Computer Simulation Conf. of the Society for Computer Simulation, Boston, 23-26 Jul. 1984
(P-6977) Avail: NTIS HC A03/MF A01

This paper highlights some recent experience in Rand's Strategy Assessment Center (RSAC), a large-scale DoD program to develop new concepts and techniques combining features of war gaming and analytic modeling. The centerpiece of the program is a system for automated war gaming in which some or all political and military national decisions can be made by automations, and in which both force operations and combat are described by theater and strategic-level models. The RSAC development program is providing a wealth of technical and managerial lessons in adapting and extending such artificial intelligence (AI) techniques as scripts, production rules, English-readable programming languages, goal-

directed search, and pattern matching. Most previous AI applications have dealt with smaller and less-complex problems, and have not had to combine AI techniques with those of well-structured systems programming and algorithmic combat modeling. Also, the RSAC integration effort has brought together professionals from at last a half-dozen cultures with good ideas but different notions of what constitutes good practice and natural logic. Author

N84-33138# National Academy of Sciences - National Research Council, Washington, D. C.
WORKSHOP ON SYSTEMS ANALYSIS Final Summary Report
Apr. 1984 115 p Workshop held in Jakarta, Indonesia, 8-12 Feb. 1983
(PB84-194661; R-84-2) Avail: NTIS HC A06/MF A01 CSCL 12B

The use of systems analysis S/A is given as a tool for attaining development goals. Particular focus is given to illustrative studies focusing on Indonesian concerns with solid waste management, urban transportation, and the food system. Addressing these concern are scientists, engineers, development specialists, administrators and educators. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-33139# Florida State Univ., Tallahassee. Dept. of Statistics.
KOLMOGOROV'S AND MOURIER'S STRONG LAWS FOR ARRAYS WITH INDEPENDENT AND IDENTICALLY DISTRIBUTED COLUMNS
Arif Zaman and Asad Zaman Feb. 1984 9 p
(Contract DAAG29-82-K-0168)
(AD-A143222; FSU-STATISTICS-M677; TR-D-66-ARO) Avail: NTIS HC A02/MF A01 CSCL 12/1

Almost sure convergence of averages of the rows is proven for arrays of random variables and for random elements in Banach spaces, which can be extended to square arrays with independent and identically distributed columns. The result requires that each column converge to a limiting random variables. A counterexample is given to show that the result fails without the condition on the columns. Author (GRA)

N84-33140# Stanford Linear Accelerator Center, Calif.
IMPLICIT FUNCTION METHOD FOR THE LIOUVILLE EQUATION
S. Kheifets May 1984 4 p
(Contract DE-AC03-76SF-00515)
(DE84-013282; SU-SLAC/AP-22) Avail: NTIS HC A02/MF A01

A general method for solving the Liouville equation is presented. First, the case of a one-dimensional nonrelativistic motion is examined, assuming that the force acting on a particle does not depend on its velocity. Next, the general three-dimensional case is considered with the force depending on velocity. The method rests heavily on the existence of two implicit functions the computation of which is transformed to a nonlinear integral equation. The Liouville equation is used in situations such as the interaction of an electron flow with an ungridded gap; or obtaining the distribution function of a particle bunch at the exit of a transport line containing nonlinear elements. S.B.

N84-33029# Paris-Sud Univ., Orsay (France). Dept. Analyse Harmonique Mathematique.
CHARACTERIZATIONS OF ZEROS IN THE FUNCTIONS OF SOME NEVANLINNA TYPE CLASSES IN THE BIDISK [CARACTERISATIONS DES ZEROS DES FONCTIONS DE CERTAINES CLASSES DE TYPE NEVANLINNA DANS LE BIDISQUE]
Philippe Charpentier *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 57-98 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33032# National Inst. for Scientific and Technical Creation, Bucharest (Romania).
THE LEVI PROBLEM FOR COHOMOLOGY CLASSES
Mihnea Coltoiu *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 141-154 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33033# Uppsala Univ. (Sweden). Matematiska Univ.
THE GROWTH OF PLURISUBHARMONIC FUNCTIONS IN INFINITE DOMAIN [CROISSANCE DES FONCTIONS PLURISOUSHARMONIQUES EN DIMENSION INFINIE]
Christer O. Kiselman *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 155-183 refs In FRENCH; ENGLISH summary (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33035# Stockholm Univ. (Sweden). Dept. of Mathematics.
ON THE CLOSURE OF SPACES OF SUMS OF RIDGE FUNCTIONS AND THE RANGE OF THE X-RAY TRANSFORM
Jan Boman *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 207-239 refs (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33036# Geneva Univ. (Switzerland). Section de Mathematiques.
DETERMINANTS CONNECTED WITH A TRACE ON A BANACH ALGEBRA [DETERMINANT ASSOCIE A UNE TRACE SUR UNE ALGEBRE DE BANACH]
P. delaHarpe and G. Skandalis (Paris 6 Univ.) *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 1 1984 p 241-260 refs In FRENCH; ENGLISH abstracts (For primary document see N84-33025 22-59)
Avail: NTIS HC A13/MF A01

N84-33040# Rouen Univ. (France). Dept. de Mathematiques.
CONFORMAL MAPPING AND ALMOST LIPSCHITZIAN CURVES [REPRESENTATION CONFORME ET COURBES PRESQUE LIPSCHITZIENNES]
Michel Zinsmeister *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 29-44 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33042# Indian Statistical Inst., New Delhi. Dept. of Mathematics.
ON THE A-INTEGRABILITY OF SINGULAR INTEGRAL TRANSFORMS
Shobba Madan *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 55-62 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33043# Imperial Coll. of Science and Technology, London (England). Dept. of Mathematics.
AN APPLICATION OF FINE POTENTIAL THEORY TO PROVE A PHRAGMEN LINDELOEF THEOREM
Terry J. Lyons *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 63-66 refs (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33044# Paris VI Univ. (France). Dept. de Mathematiques.
ANALYTIC AUTOMORPHISMS OF A BOUNDED REINHARDT DOMAIN IN A COMPLEX BANACH SPACE WITH BASE [AUTOMORPHISMES ANALYTIQUES D'UN DOMAINE DE REINHARDT BORNE D'UN ESPACE DE BANACH A BASE]
Jean-Pierre Vigue *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 67-87 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33046# New South Wales Univ., Kensington (Australia). School of Mathematics.
AN EXTENSION OF DELEEUW'S THEOREM TO THE N-DIMENSIONAL ROTATION GROUP
A. H. Dooley and G. I. Gaudry (Flinders Univ., Bedford Park, Australia) *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 111-135 refs Sponsored by the Australian Research Grant Scheme (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33048# Paris-Sud Univ., Orsay (France). Lab. d'Analyse Numerque.
BOUNDED HESSIAN FUNCTIONS [FONCTIONS A HESSIAN BORNE]
Francoise Demengel *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 155-190 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33049# Grenoble-1 Univ. (France). Lab. de Mathematiques Pures.
INFINITESMAL DEFORMATION OF LOCALLY SYMMETRICAL RIEMANN SPACES. 2: BLASCHKE'S INFINITESIMAL CONJECTURE FOR COMPLEX PROJECTIVE SPACE [DEFORMATIONS INFINITESIMALES DES ESPACES RIEMANNIENS LOCALEMENT SYMETRIQUES. 2: LA CONJECTURE INFINITESIMALE DE BLASCHKE POUR LES ESPACES PROJECTIFS COMPLEXES]
J. Gasqui and H. Goldschmidt (Columbia Univ., New York, N.Y.) *In its* Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 191-226 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

N84-33050# Toulouse Univ. (France). Dept. de Mathematiques.
SERRE'S SPECTRAL SEQUENCE AND HOMOTOPY [SUITES SPECTRALES DE SERRE EN HOMOTOPIE]
A. Didierjean and A. Legrand *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 34, No. 2 1984 p 227-242 refs In FRENCH; ENGLISH summary (For primary document see N84-33038 22-59)
Avail: NTIS HC A13/MF A01

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-33141# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
7 Sep. 1984 59 p refs Transl. into ENGLISH from various West European articles
(JPRS-WST-84-030) Avail: NTIS HC A04/MF A01

This serial report contains news items, abstracts and articles of scientific reports on aspects of science and technology including advanced materials, aerospace, biotechnology computers, factory automation, microelectronics, scientific and industrial, and technology transfer. For individual titles, see N84-33142 through N84-33144.

N84-33142# Joint Publications Research Service, Arlington, Va.
SWEDISH RESEARCH IN HIGH-TEMPERATURE CERAMICS, SUPERALLOYS c27
Ulf Bergmark *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-030) 7 Sep. 1984 p 1-5 Transl. into ENGLISH from NY Tek. (Stockholm), 26 Apr. 1984 p 34-35 (For primary document see N84-33141 22-70)
Avail: NTIS HC A04/MF A01

Fuel-efficient and wear-resistant jet engines for aircraft are sought. In theory, it is easy to construct: just use higher pressure and temperatures in the engines. Unfortunately, the present knowledge of materials places certain temperature restrictions on the engines. Energy savings seem possible with the use of a thin layer of ceramic materials, such as zirconium dioxide. A method of adhesive bonding (plasma spraying of MCrAlY alloy to the turbine blade) is needed to make the ceramic stick. Also considered are jet engines made of heat resistant materials that need no coating. B.G.

N84-33143# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM USES UNIQUE FLEXIBLE WORKSHOP WITH LASER CUTTER c36
Michel Defaux *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-030) 7 Sep. 1984 p 22-24 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 5 Jul. 1984 p 43-44 (For primary document see N84-33141 22-70)
Avail: NTIS HC A04/MF A01

To solve the problem of fabricating complex sheetmetal parts in small and medium series, Aldes just acquired a flexible line equipped with a laser cutting system that is unique in Europe. A financial risk (the total investment amounts to FF 6 million) and a technical risk as well, as many pieces of equipment are prototypes. But that was the only way to solve the company's many problems: it had a finished-product catalog of 2,500 items, including 1,500 just for network accessories (tees, connection joints). The latter, which include characteristic intersecting cylinders, used to be manufactured on request in a sheetwork shop: they were hand-drawn from a template, cut with shears and a nibbler, rolled, welded and profiled. An artisanal job involving a lot of in-process inventories, average production times of one week, and a demand that could vary in the ratio of one to two. The requirement analysis revealed a production of 3,000 cylinders per day, for over 100 different orders, to be completed in 24 to 48 hours. B.G.

N84-33144# Joint Publications Research Service, Arlington, Va.
SWEDEN: OPTICAL FIBER CARRIES LASER POWER FOR WELDING c74
Jan Segerfeldt *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-030) 7 Sep. 1984 p 25-26 Transl. into ENGLISH from NY Tek. (Stockholm), 26 Apr. 1984 p 38 (For primary document see N84-33141 22-70)
Avail: NTIS HC A04/MF A01

The use of fiber optics is not limited to telecommunications and industrial control systems. This was demonstrated at Chalmers Institute, where researchers have welded with laser light in an ordinary fiber cable. Numerous possibilities for the flexible use of laser beams exist. Instead of requiring straight lines and the use of mirrors to get the light where need it, you can conduct the radiation in flexible tubes. Since each station requires light only for a relatively short time, several stations could share the light from one laser. This would be a kind of laser time-sharing system, to borrow an analogy from data processing. The light could be distributed to the various stations by using electrooptical or acoustooptical switches. B.G.

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N84-33145*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
THE PREDICTION OF ACOUSTICAL PARTICLE MOTION USING AN EFFICIENT POLYNOMIAL CURVE FIT PROCEDURE Interim Report
Steven E. Marshall and Robert Bernhard Aug. 1984 54 p refs (Grant NAG1-58)
(NASA-CR-173915; NAS 1.26:173915; HL-84-23; Rept-0226-13) Avail: NTIS HC A04/MF A01 CSCL 20A

A procedure is examined whereby the acoustic model parameters, natural frequencies and mode shapes, in the cavities of transportation vehicles are determined experimentally. The acoustic model shapes are described in terms of the particle motion. The

acoustic modal analysis procedure is tailored to existing minicomputer based spectral analysis systems. M.A.C.

N84-33146*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
A STUDY OF METHODS TO PREDICT AND MEASURE THE TRANSMISSION OF SOUND THROUGH THE WALLS OF LIGHT AIRCRAFT. A SURVEY OF TECHNIQUES FOR VISUALIZATION OF NOISE FIELDS
Steven E. Marshall and Robert Bernhard Aug. 1984 38 p refs (Grant NAG1-58)
(NASA-CR-173917; NAS 1.26:173917; Rept-0226-14; HL-84-24) Avail: NTIS HC A03/MF A01 CSCL 10A

A survey of the most widely used methods for visualizing acoustic phenomena is presented. Emphasis is placed on acoustic processes in the audible frequencies. Many visual problems are analyzed on computer graphic systems. A brief description of the current technology in computer graphics is included. The visualization technique survey will serve as basis for recommending an optimum scheme for displaying acoustic fields on computer graphic systems. M.A.C.

N84-33147*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
APPLICATION OF STIFFENED CYLINDER ANALYSIS TO ATP INTERIOR NOISE STUDIES Final Report
E. G. Wilby and J. F. Wilby Aug. 1983 132 p refs
(Contract NAS1-16521)
(NASA-CR-172384; L-5552; NAS 1.26:172384) Avail: NTIS HC A07/MF A01 CSCL 20A

An analytical model developed to predict the interior noise of propeller driven aircraft was applied to experimental configurations for a Fairchild Swearingen Metro II fuselage exposed to simulated propeller excitation. The floor structure of the test fuselage was of unusual construction - mounted on air springs. As a consequence, the analytical model was extended to include a floor treatment transmission coefficient which could be used to describe vibration attenuation through the mounts. Good agreement was obtained between measured and predicted noise reductions when the floor treatment transmission loss was about 20 dB - a value which is consistent with the vibration attenuation provided by the mounts. The analytical model was also adapted to allow the prediction of noise reductions associated with boundary layer excitation as well as propeller and reverberant noise. Author

N84-33148*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
EXPERIMENTAL INVESTIGATION OF SHOCK-CELL NOISE REDUCTION FOR SINGLE-STREAM NOZZLES IN SIMULATED FLIGHT, COMPREHENSIVE DATA REPORT. VOLUME 1: TEST NOZZLES AND ACOUSTIC DATA
K. Yamamoto, J. F. Brausch, B. A. Janardan, D. J. Hoerst, A. O. Price, and P. R. Knott May 1984 600 p refs 3 Vol.
(Contract NAS3-22514)
(NASA-CR-168234-Vol-1; NAS 1.26:168234-Vol-1; R82AEB491-Vol-1) Avail: NTIS HC A25/MF A01 CSCL 20A

The model nozzle configurations, acoustic test conditions, and detailed test results from the hot static and simulated flight acoustic tests at the General Electric Anechoc Chamber are described. B.G.

N84-33149*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
EXPERIMENTAL INVESTIGATION OF SHOCK-CELL NOISE REDUCTION FOR SINGLE-STREAM NOZZLES IN SIMULATED FLIGHT, COMPREHENSIVE DATA REPORT. VOLUME 2: LASER VELOCIMETER DATA
K. Yamamoto, J. F. Brausch, B. A. Janardan, D. J. Hoerst, A. O. Price, and P. R. Knott May 1984 780 p refs 3 Vol.
(Contract NAS3-22514)
(NASA-CR-168234-Vol-2; NAS 1.26:168234-Vol-2; R82AEB491-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 20A

Mean velocity (axial component) and turbulent velocity (axial component) measurements for thirty one selected flow conditions of six models were performed employing the Laser Doppler Velocimeter Aerodynamic conditions which define the test points are given. Tabulations which explain the scope of mean velocity traverses and turbulence histogram measurements are also presented. The actual LV position, the type of traverse, and measured mean and turbulent velocities along copies of the LV mean velocity traces are contained. Author

N84-33150*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
EXPERIMENTAL INVESTIGATION OF SHOCK-CELL NOISE REDUCTION FOR SINGLE-STREAM NOZZLES IN SIMULATED FLIGHT, COMPREHENSIVE DATA REPORT. VOLUME 3: SHADOWGRAPH PHOTOS AND FACILITY DESCRIPTION
K. Yamamoto, J. F. Brausch, B. A. Janardan, D. J. Hoerst, A. O. Price, and P. R. Knott May 1984 208 p refs 3 Vol.
(Contract NAS3-22514)
(NASA-CR-168234-Vol-3; NAS 1.26:168234-Vol-3; R82AEB491-Vol-3) Avail: NTIS HC A10/MF A01 CSCL 20A

A total of 142 shadowgraph photographs were taken on 43 different plumes that were distributed over the six nozzle configurations using the 9.5 inch diameter collimated light beam of the shadowgraph setup. Aerodynamic flow conditions of the shadowgraph test points, the location and identification of each of the photographs, and copies of the pictures are presented. Author

N84-33151# Federal Aviation Administration, Washington, D.C. Noise Technology Branch.
NOISE MEASUREMENT FLIGHT TEST: DATA-ANALYSES AEROSPATIALE SA-365N DAUPHIN 2 HELICOPTER
J. Steven Newman (DOT, Cambridge, Mass), Edward J. Rickely, Sharon A. Daboin, and Kristy R. Beattie Apr. 1984 167 p
(AD-A143229; FAA-EE-84-2) Avail: NTIS HC A08/MF A01 CSCL 20/1

This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the Dauphin twin-jet helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise. This report is the second in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The Dauphin test program involved the acquisition of detailed acoustical, position and meteorological data. This test program was designed to address a series of objectives including: (1) acquisition of acoustical data for use in assessing heliport environment impact, (2) documentation of directivity characteristics for static operation of helicopters, (3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, (4) determination of noise event duration influences on energy dose acoustical metrics, (5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and (6) documentation of noise levels acquired using international helicopter noise certification test procedures. Author (GRA)

N84-33152# Naval Underwater Systems Center, New London, Conn.
HIGH-FREQUENCY ACOUSTIC BACKSCATTER FROM THE SEA SURFACE
W. I. Roderick, J. B. Chester, and R. K. Dullea 12 Jul. 1984 39 p Presented at the 107th Meeting of the Acoustical Society of America, Norfolk, Va., 8 May 1984
(AD-A143536; NUSC-TD-7183) Avail: NTIS HC A03/MF A01 CSCL 20/1

This document contains the slide presentation entitled High-Frequency Acoustic Backscatter From the Sea Surface, given at the 107th meeting of the Acoustic Society of America on 8 May 1984 in Norfolk, Virginia. A high resolution scattering experiment was conducted in the shallow waters of the North Atlantic. A

narrow beam parametric array, which was rotatable in both azimuth and elevation, was utilized as a broadband high-frequency acoustic projector. Acoustic surface scattering data were obtained at normal incidence and low grazing angles (less than 10 deg) as a function of acoustic transmit frequency and sea state conditions. Meteorologic and oceanographic data were obtained in concert with the acoustic measurements and included wind speed and direction, ocean surface wave spectra and currents, and ocean sound speed. Surface backscattering strength, Doppler spectra (shift and spread), and envelope statistics were some of the measured parameters. It will be shown that the Doppler spectra are approximately Gaussian and the spectral shift could be predicted from Bragg diffraction theory modified by the induced Doppler due to surface currents. The measured Doppler spreads, however, were greater than those predicted by composite roughness theory. GRA

N84-33153# Argonne National Lab., Ill. Materials Science and Technology Div.
COUPLING OF RAYLEIGH-LIKE WAVES WITH ZERO SOUND MODES IN NORMAL He-3
S. A. Bogacz and J. B. Ketterson (Northwestern Univ., Evanston, Ill.) Mar. 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15-27 Aug. 1984
(Contract W-31-109-eng-38)
(DE84-010519; CONF-840842-12) Avail: NTIS HC A02/MF A01

The damping of a wave of arbitrary (LC OMEGA) and k traveling at an interface between normal (3)He and a solid is examined. It is found that the absorption spectrum contains singularities at the thresholds for the propagation of longitudinal and transverse zero sound as well as at the Fermi velocity. DOE

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-33154# Language Services, Knoxville, Tenn.
ADONE PARAMETERS, BEAM STRUCTURE AND LUMINOSITY
C. Pellegrini 1984 67 p refs Transl. into ENGLISH of Rept-LNF-67/46 Natl. Lab. of the Natl. Comm. for Nucl. Energy, Frascati, Italy, Nov. 1967 51 p
(Contract DE-AC02-76CH-00016)
(DE84-012866; BNL-TR-1028) Avail: NTIS HC A04/MF A01

Fundamental machine characteristics are covered: acceptance of the machine and mean circulating life; beam dimensions; characteristics of the intersection zone; instability and coherent beam motion; and the Touschek effect. DOE

N84-33155# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
TIME DEVELOPMENT OF CERENKOV RADIATION
Fred R. Buskirk and John R. Neighbours May 1984 28 p
(AD-A143225; NPS-61-84-006) Avail: NTIS HC A03/MF A01 CSCL 20/8

Most developments of Cerenkov Radiation are in terms of the Fourier components of the fields and power emitted by a single electron. When many electrons in a compact bunch are emitted from an accelerator, the bunch radiates coherently and at a lower frequency than for a single electron. The theory for the time structure of the fields arising from a charge bunch is developed, and it is shown that the source of the radiation is di/dt. Present detector technology should be able to resolve these fields. Author (GRA)

N84-33156# Pittsburgh Univ., Pa.
CHEMICAL REACTIONS, RADIATIVE AND ENERGY TRANSFER PROCESSES OF IMPORTANT ATMOSPHERIC SPECIES Final Technical Report, 24 Nov. 1980 - 23 Nov. 1983
F. Kaufman Hanscom AFB, Mass. AF Geophysics Lab. 18 Apr. 1984 12 p
(Contract F19628-81-K-0022)
(AD-A143264; AFGL-TR-84-0127) Avail: NTIS HC A02/MF A01 CSCL 20/8

Laser excited NO2 fluorescence was measured as function of time, pressure, fluorescence wavelength, and temperature. Rate constants were measured for the decay of banded and continuous emission features due to quenching by 13 added gases. A general mechanism for the radiative and collisional processes was established. The rate constants of reactions at 298 K were measured by vacuum U.V. resonance fluorescence. GRA

N84-33157# Pulse Sciences, Inc., San Leandro, Calif.
PULSED POWER FOR RACETRACK INDUCTION ACCELERATORS
L. G. Schlitt, I. D. Smith, V. L. Bailey, D. L. Birx, and R. G. Sears May 1984 149 p
(Contract N00014-83-C-0475)
(AD-A143289; PSI-FR-21-167) Avail: NTIS HC A07/MF A01 CSCL 20/7

The design of the baseline accelerator system excluding the injector and extractor appears relatively straightforward. Some development is needed particularly involving the insulation system for the vertical field coil, but no major technological advancements are necessary. The resulting system requires characterization of field errors and perturbations and of the match between vertical magnetic field and particle energy. Unfortunately it is not known whether the accelerating environment produced by the baseline design described above is consistent with stable beam acceleration. Synchronization of the vertical magnetic field with particle energy can be provided by a simple passive integration of the acceleration pulse in the baseline design. GRA

N84-33158# Argonne National Lab., Ill.
PRESENT STATUS AND PROBABLE FUTURE CAPABILITIES OF HEAVY-ION LINEAR ACCELERATORS
L. M. Bollinger 30 Apr. 1984 7 p refs Presented at 10th Intern. Conf. on Cyclotrons and their Appl., East Lansing, Mich., 30 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-011741; CONF-8404143-4) Avail: NTIS HC A02/MF A01

The general characteristics of heavy-ion linacs are summarized, with emphasis on the similarities and differences of systems based on different technologies. The main design considerations of superconducting linacs are outlined, the many projects based on this technology are listed, and a new concept for a superconducting injector linac is described. The role of radio frequency quadrupole (RFQ) structures for heavy-ion acceleration is summarized. Some probable applications of heavy-ion accelerators during the next decade are listed. DOE

N84-33159# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
SPOT HEATING CALCULATION FOR A HEAVY ION DRIVEN HIGH TEMPERATURE EXPERIMENT
E. P. Lee and J. W-K. Mark Apr. 1984 38 p refs
(Contract DE-AC03-76SF-00098)
(DE84-013879; LBL-16890) Avail: NTIS HC A03/MF A01

An analytical model is used to predict the temperature reached in a spot heating experiment driven by a heavy ion beam. A discussion of physical processes and approximations is included. DOE

N84-33160# Wayne State Univ., Detroit, Mich.
FREE CHARGED PARTICLE BEHAVIOR IN INTENSE LASER FIELDS Final Report, 15 Jul. 1980 - 14 Jan. 1984
David M. Fradkin Mar. 1984 6 p
(Contract DE-AC02-80ER-10669)
(DE84-013700; DOE/ER-10669/2) Avail: NTIS HC A02/MF A01

Theoretical studies were performed examining the effect of intense laser fields, together with auxiliary electromagnetic field configuration, on the behavior of otherwise free charged particles. The Lorentz-Dirac classical equation was employed to determine the effect of radiation reaction on the transfer of asymptotic energy momentum to a particle by a single intense plane wave pulse. The added effect due to a uniform magnetic field along the pulse

propagation direction was determined. Single particle Dirac theory was employed to analyze particle polarization direction changes in a quantum-mechanical model. The general nature of the Lorentz transformation as a active transformation connecting initial and final states was determined, in which a single state characterization parameter was left unspecified. Analytic and computer studies were made of the effect of two simultaneous laser pulses, propagating in opposite directions on particle dynamics. DOE

N84-33161# Texas A&M Univ., College Station. Dept. of Physics.
INTERMEDIATE-ENERGY NUCLEAR THEORY Progress Report, 1 Mar. 1982 - 29 Feb. 1984
R. A. Bryan, B. J. VerWest, and C. A. Dominguez May 1984 41 p
(Contract DE-AS05-76ER-05223)
(DE84-012971; DOE/ER-05223/68) Avail: NTIS HC A03/MF A01

The following topics are discussed in terms of research progress: nucleon-nucleon theory and phase shift analysis, three-hadron systems, hadronic form factors, and the theory of elementary Dirac particles. In addition, nucleon-nucleon scattering, pion production amplitudes, relativistic three body equations, electron-deuteron polarizations, and the dynamical theory of isospin are considered along with other topics in theoretical physics. R.S.F.

N84-33162# Brookhaven National Lab., Upton, N. Y.
GAMMA-RAY SPECTROSCOPY OF HYPERNUCLEI
R. E. Chrien 1984 28 p refs Presented at Intern. Symp. on In-Beam Nucl. Spectry., Debrecen, Hungary, 14 May 1984
(Contract DE-AC02-76CH-00016)
(DE84-013142; BNL-34846; CONF-840530-4) Avail: NTIS HC A03/MF A01

The study of hypernuclei is a frontier area of nuclear physics. As more intense beams of strange mesons have become available, methods of in-beam spectroscopy are applied to the study of hypernuclei. The feasibility of detecting hypernuclear electromagnetic radiation was demonstrated at the Brookhaven Alternating Gradient Synchrotron. Studies were made of the effective LAMBDA hyperon-nucleon interaction in p-shell hypernuclei. The first results are described and they place useful constraints on the effective interaction and the shell model description of hypernuclear states. DOE

N84-33163# Department of Energy, Washington, D. C.
AUTOGENERATOR OF BEAMS OF CHARGED PARTICLES Patent Application
Richard J. Adler, Michael G. Mazarakis, Robert M. Miller, Steven L. Shope, and David L. Smith, inventors (to DOE) Filed 31 Oct. 1983 28 p
(Contract DE-AC04-76DP-00789)
(DE84-014242; US-Patent-Appl-SN-547279) Avail: NTIS HC A03/MF A01

An autogenerating apparatus provides secondary intense relativistic current beam pulses in response to an injected beam pulse. One or more electromagnetic energy storage devices are provided in conjunction with gaps along a beam propagation path for the injected beam pulse. For injected beam pulses which are no longer than double the transit time of electromagnetic waves within the storage devices (which may be resonant cavities), distinct secondary beam pulses are generated by each of the energy storage devices. The beam propagation path, together with the one of more gaps provided therein, operates a pulse forming transmission line cavity, in which the separate cavities associated with the gaps provide delays for electromagnetic waves generated at the gaps. After doubly traversing the cavity, the electromagnetic waves cause the gap to generate the secondary beam pulses, which are thus delayed by a time interval equal to the double transit time for the induced wave within the cavity. DOE

N84-33337# Massachusetts Inst. of Tech., Cambridge.
MOLECULE MICROSCOPY
Joseph G. King, A. P. French, A. Essig, Joseph A. Jarrell, and S. J. Rosenthal *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 1-4 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33339# Massachusetts Inst. of Tech., Cambridge.
ATOMIC RESONANCE AND SCATTERING
Daniel Kleppner, D. E. Pritchard, R. Ahmad-Bitar, T. Ducas, D. Kelleher, M. Ligare, A. M. Lyyra, P. Moskowitz, K. L. Saenger, N. Smith et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 7-8 ref (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33341# Massachusetts Inst. of Tech., Cambridge.
X-RAY DIFFUSE SCATTERING
Robert J. Birgeneau, A. R. Kortan, M. Sutton, K. Evans-Lutterodt, J. Hong, L. J. Martinez-Miranda, S. G. J. Mochrie, B. M. Ocko, and E. Specht *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 23-26 refs (For primary document see N84-33336 22-99)
(Contract DAAG29-83-K-0003)
Avail: NTIS HC A12/MF A01

N84-33352# Massachusetts Inst. of Tech., Cambridge.
PHOTON CORRELATION SPECTROSCOPY AND APPLICATIONS
Sow-Hsin Chen, M. Kotlarchyk, Y. S. Chao, C. L. Lin, C. Mizumoto, and E. Sheu *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 83-84 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-33164# Sandia Labs., Albuquerque, N. Mex.
EXPERIMENTAL INVESTIGATION OF CERTAIN BEAM TRANSPORT ISSUES IN A PULSED TRANSMISSION LINE LINEAR ACCELERATOR
M. G. Mazarakis, R. B. Miller, S. L. Shope, L. E. Stevenson, D. P. Coleman, J. W. Poukey, R. J. Adler (Mission Research Corp., Albuquerque, N. Mex.), and T. C. Genoni (AFWL, Kirtland AFB, N. Mex.) 1984 4 p refs Presented at the Linear Accelerator Conf., Darmstadt-Seeheim, West Germany, 7 May 1984
(Contract DE-AC04-76DP-00789)
(DE84-011191; SAND-84-0095C; CONF-840529-28) Avail: NTIS HC A02/MF A01

The development of a new generation of high current, high voltage, linear induction accelerators relies on the solution of a number of beam transport problems, including radial oscillations, diocotron instabilities, and transverse beam break-up. Most of the instabilities appear to onset either at the injector region or at the accelerating gaps. Radial oscillations were first observed in Radlac I, while transverse beam breakup was first observed on the SLAC accelerator, and more recently on the ETA accelerator. A reliable 4 MeV electron beam injector was developed. It produces a high quality annular or solid beam of low emittance with no radial oscillations. DOE

N84-33165# Stanford Linear Accelerator Center, Calif.
FUTURE OF HIGH ENERGY PHYSICS
W. K. H. Panofsky Jun. 1984 26 p refs
(Contract DE-AC03-76SF-00515)
(DE84-013513; SU-SLAC-Pub-3357) Avail: NTIS HC A03/MF A01

A rough overview is given of the expectations for the extension of high energy colliders and accelerators into the extremely high energy range. It appears likely that the SSC or something like it will be the last gasp of the conventional method of producing

high energy proton-proton collisions using sychrotron rings with superconducting magnets. It is likely that LEP will be the highest energy e+e(-) colliding beam storage ring built. The future beyond that depends on the successful demonstrations of new technologies. The linear collider offers hope in this respect for some extension in energy for electrons, and maybe even for protons, but is too early to judge whether, by how much, or when such an extension will indeed take place. DOE

N84-33166# Pacific Northwest Lab., Richland, Wash.
AIRCRAFT, SHIPS, SPACECRAFT, NUCLEAR PLANTS AND QUALITY
M. G. Patrick May 1984 16 p Presented at the American Society of Quality Control, Richland Sect. Meeting, Richland, Wash., 17 May 1982
(Contract DE-AC06-76RL-01830)
(DE84-013262; PNL-SA-12287; CONF-8205268-1) Avail: NTIS HC A02/MF A01

A few quality assurance programs outside the purview of the Nuclear Regulatory Commission were studied to identify features or practices which the NRC could use to enhance its program for assuring quality in the design and construction of nuclear power plants. The programs selected were: the manufacture of large commercial transport aircraft, regulated by the Federal aviation Administration; US Navy shipbuilding; commercial shipbuilding regulated by the Maritime Administration and the US Coast Guard; Government-owned nuclear plants under the Department of Energy; spacecraft under the National Aeronautics and Space Administration; and the construction of nuclear power plants in Canada, West Germany, France, Japan, Sweden, and the United Kingdom. DOE

N84-33167# Texas A&M Univ., College Station. Dept. of Physics.
HIGH ENERGY PHYSICS RESEARCH AT TEXAS AGRICULTURE AND MINING UNIVERSITY Annual Report, 1 Jan. 1983 - 31 Dec. 1983
R. C. Webb 1984 30 p refs
(Contract DE-AS05-81ER-40039)
(DE84-011616; DOE/ER-40039/T1) Avail: NTIS HC A03/MF A01

Magnetic monopoles in cosmic rays were examined. The monopole detector, which has a scintillation counter, is described. The design of hadron calorimeters is also discussed. The use of a polycarbonate blend of materials in the construction of gas ionization chambers needed for these calorimeters is considered. Future research plans are outlined. R.S.F.

N84-33168# Space Power, Inc., Sunnyvale, Calif.
THERMIONIC CONVERSION REACTOR TECHNOLOGY ASSESSMENT Final Report
Feb. 1984 201 p refs
(Contract DE-AC03-83SF-11725)
(DE84-007611; DOE/SF-11725/T1) Avail: NTIS HC A10/MF A01

The in-core thermionic space nuclear power supply is the only identified reactor-power concept that meets the SP-100 size functional requirements with demonstrated state-of-the-art reactor system and space-qualified power system component temperatures. The SP-100 configuration limits provide a net 40 m(2) of primary non-deployed radiator area. If a reasonable 7 year degradation allowance of 15% to 20% is provided then the beginning of life (BOL) net power output requirement is about 120 kWe. Consequently, the SP-100 power system must produce a P/A of 2.7 kWe/m(2). This non-deployed radiator area power density performance is only reasonably achieved by the thermionic in-core converter system, the potassium Rankine turbine system and the Stirling engine system. Past and current tests and data were examined and the potential for successful development of suitable fueled-thermionic converters that will meet SP-100 and growth requirements was assessed. The basis for the assessment will be provided and the recommended key developments plant set forth. DOE

N84-33169# Florida Inst. of Tech., Melbourne.
SPACE REACTORS: WHAT IS A KILOGRAM?
D. Buden, J. Angelo, Jr., D. Ek (AFWL), and S. Voss (AFWL) 1984 13 p refs Presented at the 19th Ann. IECEC Meeting, San Francisco, 19-24 Aug. 1984 Submitted for publication
(Contract W-7405-eng-36)
(DE84-012656; LA-UR-84-1378; CONF-840804-20) Avail: NTIS HC A02/MF A01

The use of nuclear electric propulsion can triple payloads to GEO for a single Shuttle launch. Life orbits of 300 years can be used to allow most of the fission and activation products to decay before a reactor reenters the biosphere. Enough radioactive materials remain with very long lifetimes to make it desirable to design the reactor to disperse upon reentry and little additional risk to the biosphere is introduced by initiating NEP operations from 300 km. DOE

N84-33170# Cincinnati Univ., Ohio.
INELASTIC STRONG INTERACTIONS AT HIGH ENERGIES Final Report, 1 Jun. 1976 - 31 May 1984
Peter Suranyi 1984 18 p refs
(Contract DE-AC02-76ER-02978)
(DE84-013647; DOE/ER-02978/11) Avail: NTIS HC A02/MF A01

Work in Reggeon Field Theory RTF is described. Multiparticle processes are studied. A study of model independent predictions is made for various high energy cross-sections, introducing the concept of sections. The quantum mechanics of polynomial potentials is examined as a model for quantum field theories. The Higgs sector is examined and various symmetry breaking patterns are found using different representations for the Higgs. Lattice gauge theories are studied. One exactly soluble one-dimensional model is studied as well as an extended investigation of Hamiltonian Lattice gauge theories. The weak coupling behavior of global and local abelian lattice gauge theories is examined in arbitrary dimensions, using various periodic trial functions and the WKB approximation. Supersymmetry and supergravity are investigated. The compatibility of scale transformations in super space and the properties of scale invarient theories in ordinary spacetime are discussed. The largest possible local linear symmetry allowed is presented given the structure of spacetime. A systematic method for performing dimensional reduction on theories which admit abelian killing vectors is developed. DOE

74 OPTICS

Includes light phenomena.

N84-33171 Department of the Navy, Washington, D. C.
TARGET FOR OPTICALLY ACTIVATED SEEKERS AND TRACKERS Patent
C. T. Lakin and N. F. Willett, inventors (to Navy) Issued 1 May 1984 6 p Supersedes AD-D009560
(AD-D011059; US-Patent-4,446,363; US-Patent-Appl-SN-353682; US-Patent-Class-250-203-R) Avail: US Patent & Trademark Office CSCL 20/6

This abstract discloses a target for optically activated seekers and trackers (TOAST) which provides for calibrated and variable target characteristics such as size, intensity, spatial position, color and interfering background. The TOAST has a first illumination system providing a target light beam through an adjustable iris which controls image size. The target beam passes through a collimator lens which focuses the light at infinity. With the target beam focused at infinity, the motion of an elevation plate lengthens or shortens the distance from the collimator lens to a one motion mirror. The target beam is attenuated by a variable filter driven by a servo-motor, and a color selection process is provided by passing the beam through spectral filters. A background light beam with background imagery is provided to the beamsplitter mirror and mixed with the target image so as to simulate the target environ-

ment encountered by an operating optically activated seeker and tracker. GRA

N84-33172 Department of the Air Force, Washington, D.C.
REAL-TIME OPTICAL FILTERING SYSTEM WITH SPATIAL AND TEMPORAL ENHANCEMENT OF VISUAL INFORMATION Patent
D. W. Evans, inventor (to Air Force) 12 Jun. 1984 5 p Supersedes AD-D009352
(AD-D011106; US-Patent-4,453,804; US-Patent-Appl-SN-337349; US-Patent-Class-350-162.12) Avail: US Patent & Trademark Office CSCL 20/6

In a system of real-time coherent optical filtering of visual imagery which encompassed a laser and a set of lenses for transmitting a visual target image of an input, a Fabry-Perot interferometer for filtering the target image to produce a filtered target image at an output having a predetermined bandwidth of spatial frequency information, the improvements relate to transmitting and original unfiltered image to the output for overlaying the filtered image, and flickering the filtered image to achieve temporal enhancement of the visual information in the spatial frequency bandwidth of interest. GRA

N84-33173 Department of the Air Force, Washington, D.C.
VARYING BANDPASS OF OPTICAL SPATIAL FILTER BY ROTATING MIRRORS HAVING CHANGING REFLECTIVITY Patent
D. W. Evans, inventor (to Air Force) Issued 15 May 1984 7 p Supersedes AD-D009292
(AD-D011114; US-Patent-4,448,486; US-Patent-Appl-SN-337350; US-Patent-Class-350-162.12) Avail: US Patent & Trademark Office CSCL 20/6

In a system of real-time coherent optical filtering of visual imagery having a Fabry-Perot interferometer for use as a variable bandpass spatial filter, the improvement relates to the pair of mirrors of the interferometer mounted in spaced parallel relationship to one another for rotation about a common axis. The mirrors each have a reflectivity value which changes as a function of rotation. Thus, the bandwidth of the interferometer in acting as a filter can be adjusted by merely rotating one or both of the mirrors. Author (GRA)

N84-33174 Department of the Navy, Washington, D. C.
FIBER OPTIC SENSOR WITH ENHANCED IMMUNITY TO RANDOM ENVIRONMENTAL PERTURBATIONS Patent
S. C. Rashleigh, inventor (to Navy) Issued 10 Apr. 1984 13 p Supersedes AD-D008868
(AD-D011115; US-Patent-4,442,350; US-Patent-Appl-SN-293589; US-Patent-Class-250-227) Avail: US Patent & Trademark Office CSCL 20/6

A sensor is provided for sensing or detecting the presence of an environmental field condition such as acceleration, temperature change, magnetic or acoustic fields. The field is sensed by interference between two mutually orthogonal polarized eigenmodes in a single monomode optical fiber which may be disposed either linearly or wound on a mandrel made of compliant material for sensing an acoustic field, or made of magnetostrictive material for sensing a magnetic field. Polarized light propagated through the optical fiber is detected at its outlet independent of environmentally induced low frequency variations whereby the sensor may be maintained at quadrature and maximum sensitivity. Author (GRA)

N84-33175 Department of the Air Force, Washington, D.C.
OPTICAL POWER SOURCE CONTROL SYSTEM Patent
C. R. Husbands, inventor (to Air Force) Issued 15 May 1984 5 p Supersedes AD-D009199
(AD-D011124; US-Patent-4,449,043; US-Patent-Appl-SN-316703; US-Patent-Class-250-205) Avail: US Patent & Trademark Office CSCL 10/2

An optical power source control system having a four port optical coupler, an optical receiver and associated comparator circuits operably connected to the optical transmission line connecting the source to an output connector. When the output connector is mated with another connector, the receiver senses the optical energy reflected from the glass/air and air/glass interfaces of the connectors and provides an appropriate signal. This signal is sufficiently high when compared to a threshold voltage level to permit the power source to operate. When the output connector is in the unmated condition the reflected optical power from the air/glass interface is no longer present and therefore the signal from the receiver falls below the threshold voltage level. With this reduced signal level, power flow to the optical source is removed or reduced thereby controlling the operation of the optical power source. Author (GRA)

N84-33176 Department of the Air Force, Washington, D.C.
OPTICAL DISTORTION ANALYZER SYSTEM Patent
J. Taboada, inventor (to Air Force) Issued 12 Jun. 1984 17 p Supersedes AD-D009492
(AD-D011127; US-Patent-4,453,827; US-Patent-Appl-SN-297527; US-Patent-Class-356-353) Avail: US Patent & Trademark Office CSCL 20/6

An optical distortion analyzer system which is capable of automatically quantifying with a high degree of accuracy and repeatability the optical quality of transparencies such as windshields or windows is described. The analyzer system is made up of a platform adapted to support the transparency with two degrees of freedom. A probe beam of electromagnetic radiation emanating from a laser is passed through the transparency and is moved about a horizontal and vertical axis establishing a plurality of test points on the transparency. An analyzed unit receives the probe beam therefrom and establishes horizontal and vertical deviations in the transparency as well as determining the cylindrical and spherical lens power components and principal meridian angle of the transparency. A processor provides recognizable opthalmic parameters of the above characteristics of the transparency and correlates these parameters with the plurality of test points on the transparency. GRA

N84-33177 Department of the Air Force, Washington, D.C.
REPLICATION OF HIGH POWER LASER MIRRORS Patent
J. G. Gowan, inventor (to Air Force) Issued 12 Jun. 1984 4 p Supersedes AD-D009364
(AD-D011140; US-Patent-4,453,587; US-Patent-Appl-SN-339205; US-Patent-Class-164-46) Avail: US Patent & Trademark Office CSCL 20/6

A method for replicating laser mirror surfaces is described. This method comprises careful preparation, as, for example, by single point diamond turning, on a master block, of a master surface having the contour corresponding to the desired laser mirror surface, vapor depositing onto the master surface a thin metallic layer, and vapor depositing the laser mirror faceplate material to the desired thickness. The selected master block material has a coefficient of thermal expansion mismatch with that of the deposited faceplate material so that the master block shrinks and separates away from the deposited faceplate upon cooldown from the vapor deposition temperature. Author (GRA)

N84-33178*# California Inst. of Tech., Pasadena. Big Bear Solar Observatory.
ULTRAVIOLET RESPONSE OF FILM CANDIDATES FOR THE SOLAR OPTICAL TELESCOPE PHOTOMETRIC FILTERGRAPH
John A. Morgan Oct. 1983 22 p refs
(Contract NAS5-27269)
(NASA-CR-175254; NAS 1.26:175254; BBSO-0229) Avail: NTIS HC A02/MF A01 CSCL 20F

Measurements of UV response between 2000 and 3000 A of Kodak films 2415, Aerocon II 3412, and SO-415 are reported. The short wavelength cutoff of the response of all films studied lies near 2100 A, occurring as a gentle falloff starting near 2500 A. The sensitivity of the films appears to remain roughly constant from 2500 to 3000 A. Estimates of UV Gamma for 2415 and the effect of hard UV on the optics in the experiment are also discussed. Author

N84-33179*# National Aeronautics and Space Administration. Pasadena Office, Calif.
LOW LOSS SPLICING METHOD FOR SINGLE-MODE OPTICAL FIBER Patent Application
George F. Lutes, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 7 Aug. 1984 8 p
(Contract NAS7-100)
(NASA-Case-NPO-16294-1; NAS 1.71:NPO-16294-1; US-Patent-Appl-SN-638585) Avail: NTIS HC A02/MF A01 CSCL 20F

An inexpensive method for accurately aligning and joining together two single-mode optical fibers is provided. A capillary tube is employed into which the fibers are inserted. One fiber is mounted in a micropositioner and its end is inserted into the tube a relatively short distance. The short insertion depth enables accurate alignment of the fibers, which are secured into place by an ultraviolet-cured epoxy. NASA

N84-33180# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEVELOPMENT OF A SPECTRORADIOMETER WITH A LINEAR NETWORK OF DETECTORS FROM STANDARD CCD M.S. Thesis - 16 Dec. 1983 [DESENVOLVIMENTO DE UM ESPECTRORADIOMETRO COM UMA REDE LINEAR DE DETECTORES DO TIPO CCD]
Antonio Lopes Filho May 1984 95 p refs
(INPE-3095-TDL/165) Avail: NTIS HC A05/MF A01

The design of an instrument for spectral reflectance measurements is described. The project provides a choice of detection bands in the spectral region from 400 to 900 nm. INPE is going to use such an instrument in the remote sensing Brazilian satellite spectral band determination. Author

N84-33181*# Hughes Research Labs., Malibu, Calif.
DEFINITION, ANALYSIS AND DEVELOPMENT OF AN OPTICAL DATA DISTRIBUTION NETWORK FOR INTEGRATED AVIONICS AND CONTROL SYSTEMS. PART 2: COMPONENT DEVELOPMENT AND SYSTEM INTEGRATION Final Report, 1 May 1979 - 31 Mar. 1984
H. W. Yen and R. J. Morrison Jun. 1984 80 p refs
(Contract NAS1-15829)
(NASA-CR-172429; NAS 1.26:172429) Avail: NTIS HC A05/MF A01 CSCL 20F

Fiber optic transmission is emerging as an attractive concept in data distribution onboard civil aircraft. Development of an Optical Data Distribution Network for Integrated Avionics and Control Systems for commercial aircraft will provide a data distribution network that gives freedom from EMI-RFI and ground loop problems, eliminates crosstalk and short circuits, provides protection and immunity from lightning induced transients and give a large bandwidth data transmission capability. In addition there is a potential for significantly reducing the weight and increasing the reliability over conventional data distribution networks. Wavelength Division Multiplexing (WDM) is a candidate method for data communication between the various avionic subsystems. With WDM all systems could conceptually communicate with each other without time sharing and requiring complicated coding schemes for each computer and subsystem to recognize a message. However, the state of the art of optical technology limits the application of fiber optics in advanced integrated avionics and control systems. Therefore, it is necessary to address the architecture for a fiber optics data distribution system for integrated avionics and control systems as well as develop prototype components and systems. Author

N84-33182# TRW, Inc., Redondo Beach, Calif. Electro Optics Research Center.
THE 1.4 gb/S OPTICAL REPEATER DEVELOPMENT Final Report, Sep. 1982 - Mar. 1984
G. Hayward Mar. 1984 39 p
(Contract N00014-82-C-2478)
(AD-A143331) Avail: NTIS HC A03/MF A01 CSCL 20/6

We report on the design and implementation of several optical repeaters at 1.4 Gb/s with both short (0.85 micron) and long (1.3 micron) operating wavelength for use in single mode fiber transmission system. Author (GRA)

N84-33183# Naval Research Lab., Washington, D. C.
POINT RESPONSE FUNCTIONS FOR UNFILLED OPTICAL ARRAYS
J. H. Spencer and R. S. Simon 27 Jul. 1984 48 p Original contains color illustrations
(RR0-3406)
(AD-A143384; NRL-MR-5355) Avail: NTIS HC A03/MF A01 CSCL 20/6

Two problems relating to the design of arrays for imaging complex fields are the sidelobe levels and the energy within those sidelobes. While designers often know the performance of a filled aperture, the much larger number of parameters involved in array design lead to great difficulty evaluating the performance level. This report describes a family of optical arrays whose parameters were evaluated by a computer analysis system. For simplicity all the arrays considered were in the same family (a circular ring of evenly spaced array elements), so that comparisons could be made as the number of array elements was varied. Arrays with 3, 7, 15, and 27 elements were considered in detail, including the proper corrections for both finite element size and finite bandpass. GRA

N84-33184# IBM Research Lab., San Jose, Calif.
THE INTERPRETATION OF VERY LOW FREQUENCY RAMAN SCATTERING FROM ROUGHENED SILVER ELECTRODES: CLUSTERS, CAVITIES OR COMPLEXES?
R. M. Corn and M. R. Philpott Jul. 1984 18 p
(Contract N00014-82-C-0583)
(AD-A143471; TR-5) Avail: NTIS HC A02/MF A01 CSCL 20/6

The potential dependence of the broad low frequency Raman scattering features from roughened silver electrodes and their Sensitivity to the chemical composition of the supporting electrolyte are presented. We find that the electromagnetic enhancement theories which relate these Raman bands to the vibrations of the silver surface structures are unable to account for all of the data; electronic coupling to the stabilizing adsorabates requires that some of the charge transfer concepts of the adatom complex theories be included in the model. GRA

N84-33185# Hughes Research Labs., Malibu, Calif.
INVESTIGATION OF OPTICAL FIBERS FOR NONLINEAR OPTICS Final Report, 1 Jan. - 31 Dec. 1983
L. G. DeShazer, J. A. Harrington, A. C. Pastor, and S. C. Rand 17 Apr. 1984 45 p
(Contract F49620-82-C-0030)
(AD-A143565; AFOSR-84-0574TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

The principal objective of this research program is to develop single crystal (SC) fibers for use in nonlinear optical devices. This encompasses measurement of physical and chemical properties of several candidate materials, fabrication of SC fibers, and investigation of nonlinear optical applications. This report describes the successful fabrication of more than a half dozen single crystal fibers using new growth techniques and progress with hybrid fibers which show great promise for nonlinear optical applications. Author (GRA)

N84-33186# Department of the Navy, Washington, D. C.
POLYNOMINAL GRATING Patent Application
J. F. Meekins and H. Gursky, inventors (to Navy) Filed 30 May 1984 25 p
(AD-D011090; US-Patent-Appl-SN-615504) Avail: NTIS HC A02/MF A01 CSCL 20/6

This invention relates to diffraction gratings. More specifically this invention relates to diffraction gratings with high resolution over a broad wavelength range in the far ultraviolet and soft X-ray band. GRA

N84-33187# Department of the Air Force, Washington, D.C.
PHASE-ONLY OPTICAL FILTER FOR USE IN AN OPTICAL

CORRELATION SYSTEM Patent Application
J. L. Horner, inventor (to Air Force) Filed 3 Apr. 1984 31 p
(AD-D011093; US-Patent-Appl-SN-596471) Avail: NTIS HC A03/MF A01 CSCL 20/6

A phase-only optical filter capable of being utilized within a phase-only optical correlation system is disscussed. The phase-only optical filter is made by mathematically generating preselected phase-only information by a fast Fourier Transform technique. This generated phase-only information is transferred onto an unexposed holographic film. Thereafter, the film is developed and bleached. The resultant bleached film is the phase-only filter which, when utilized in a correlation system, provides substantially 100% utilization of the source of electromagnetic radiation during the correlation process. GRA

N84-33188# Department of the Air Force, Washington, D.C.
METHOD OF MEASURING OPTICAL PROPERTIES OF A TRANSPARENCY Patent Application
L. V. Genco and H. L. Task, inventors (to Air Force) Filed 4 May 1984 12 p
(AD-D011117; US-Patent-Appl-SN-607090) Avail: NTIS HC A02/MF A01 CSCL 14/5

A method of measuring optical properties of a transparency uses a video camera for focusing and then refocusing an image of a point source of light transmitted through a test region when the transparency is first absent and then later present at the test region. The distance the camera needs to be moved together with the focal length of a focusing lens used in carrying out the method provide sufficient quantitative data to calculate the spherical optical power of the transparency. Also, the camera generates video images of the point source both before and after the transparency is present in the test region. These images are displayed on a screen containing a grid pattern which facilitates measurement of the displacement of the image from the center of the grid or from the optical axis due to the presence of prismatic deviation in the transparency. Given the earlier data and supplemented by the latter displacement quantity, the prismatic deviation of the transparency can also be calculated.
Author (GRA)

N84-33189# Lippke (Paul) G.m.b.H. und Co. K.G., Neuwied (West Germany).
INTELLIGENT INFRARED SENSOR Final Report, Aug. 1981
Jan Kraus Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 83 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-092; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,50.

The development of a modular sensor for the quantitative on-line analysis of sheet type materials in the near infrared is described. Measurement tasks in extrusion coating of board and metallic substrates were chosen to design and field test a set of optical sensor elements together with corresponding mathematical models to measure the thickness of one or two spectrally differing polymers. The same optical elements served as a basis for the development and field test of methods of moisture measurement in paper and board. The models used are applicable to other fields of infrared measurement. Author (ESA)

N84-32596# Joint Publications Research Service, Arlington, Va.
PECULIARITIES IN CONSTRUCTION OF OPTICAL RECEIVERS FOR DIGITAL FIBER-OPTIC COMMUNICATION LINES Abstract Only
O. B. Pismerov and I. M. Derevyannykh *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 25-26 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 63-66 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32601# Joint Publications Research Service, Arlington, Va.
IMAGE IDENTIFICATION BY METHOD OF INTEGRAL FLUCTUATIONS Abstract Only
A. Ye. Gorodetskiy, P. P. Kuzmin, and I. L. Tarasova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 40-41 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 26, no. 11, Nov. 1983 p 70-74 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32613# Joint Publications Research Service, Arlington, Va.
EVALUATION OF THE LIMITING ACCURACY IN DETERMINING THE COORDINATES OF A POINT LIGHT SOURCE BY A TELEVISION TRACKING SYSTEM USING AN IMAGE DISSECTOR WITH THE PRESENCE OF A NONSTATIONARY CURRENT COMPONENT
V. I. Tislenko and Yu. V. Martyshevskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 52-58 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Priborostr. (Leningrad), v. 27, no. 1, 1984 p 29-34 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-33343# Massachusetts Inst. of Tech., Cambridge.
OPTICS AND QUANTUM ELECTRONICS
C. G. Fonstad, Hermann A. Haus, E. P. Ippen, S. Kawakami, Y. Yamamoto, H. Stram, E. Wintner, N. Dagli, J. Fujimoto, C. Gabriel et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 31-40 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33344# Massachusetts Inst. of Tech., Cambridge.
QUANTUM OPTICS AND PHOTONICS
S. Ezekiel, B. R. Mollow, John Kierstead, J.-M. Chanty, D. DiFilippo, P. R. Hemmer, S. H. Jain, R. E. Meyer, B. W. Peuse, D. R. Ponikvar et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 41-47 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33346# Massachusetts Inst. of Tech., Cambridge.
INFRARED NONLINEAR OPTICS
Peter A. Wolff, Roshan L. Aggarwal, Piotr Becla, Chiravurri Jagannath, L. R. Ram-Mohan, Y. C. Sunny Yuen, Gregory Boebinger, S. Warnock, S. Wong, and Eric P. Youngale *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 51-52 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33144# Joint Publications Research Service, Arlington, Va.
SWEDEN: OPTICAL FIBER CARRIES LASER POWER FOR WELDING
Jan Segerfeldt *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-030) 7 Sep. 1984 p 25-26 Transl. into ENGLISH from NY Tek. (Stockholm), 26 Apr. 1984 p 38 (For primary document see N84-33141 22-70)
Avail: NTIS HC A04/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-33190# Naval Research Lab., Washington, D. C.
MODIFIED THOMSON PARABOLA ION SPECTROMETERS FOR USE IN LASER GENERATED PLASMA EXPERIMENTS
S. T. Kacenjar and C. K. Manka 29 Jun. 1984 35 p
(DNA Proj. I25-BMXI)
(AD-A143298; NRL-MR-5363) Avail: NTIS HC A03/MF A01 CSCL 14/2

Two devices for the measurement of the velocity distribution of ions from laser-produced plasmas are presented. Characteristics

of the normal Thomson Parabola apparatus are examined under the constraints of small overall dimensions (few centimeters) and moderate ion velocities. A second device uses a novel modification of the Thomson Parabola apparatus to produce separation of the ionic species into linear traces. The same constraints are employed for this apparatus. The use of solid state track detectors, charge collectors, and microchannel plates in both devices are discussed. GRA

N84-33191# Naval Research Lab., Washington, D. C.
INFLUENCE OF MAGNETIC SHEAR ON THE COLLISIONAL CURRENT DRIVEN ION CYCLOTRON INSTABILITY Memorandum Report, Oct. 1983 - Oct. 1984
P. Satyanarayana, G. Ganguli, and S. L. Ossakow 5 Jul. 1984 30 p
(DNA Proj. S99-QMXB; RR0-3302)
(AD-A143391; AD-E400961; NRL-MR-5345) Avail: NTIS HC A03/MF A01 CSCL 20/9

The effects of magnetic shear on the collisional current driven ion cyclotron instability are discussed by incorporating the self-consistent magnetic shear produced by the currents driving the instability itself. GRA

N84-33192# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
NEGATIVE ION FORMATION DUE TO HYDROGEN PLASMA SURFACE INTERACTION
K. N. Leung and K. W. Ehlers May 1984 13 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14-18 May 1984
(Contract DE-AC03-76SF-00098)
(DE84-012259; LBL-16979; CONF-840520-5) Avail: NTIS HC A02/MF A01

Negative ions can be produced by a desorption process when energetic positive hydrogen ions impinge on the surface of reactor walls. The relative yield of different negative ions generated from various surface materials (such as Mo, Pt, Pd,Rh, Cu, Ta, Au, C, TiC and stainless-steel) have been compared in a multicusp plasma source. The negative ions generated are self-extracted from the source, and are identified by a mass spectrometer. The total negative ion current is measured by a Faraday cup. DOE

N84-33193# Oak Ridge National Lab., Tenn.
RELIABILITY OF INITIAL-VALUE MHD CALCULATIONS OF TOKAMAK DISRUPTIONS
H. R. Hicks, B. A. Carreras, L. Garcia, and J. A. Holmes Jun. 1984 80 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013600; ORNL/TM-9127) Avail: NTIS HC A05/MF A01

The nonlinear coupling of resistive tearing modes was proposed as the mechanism for some Tokamak disruptions. This is based primarily on initial value resistive magnetohydrodynamic calculations performed with a finite difference grid in minor radius and Fourier series expansion in the poloidal and toroidal angles. The calculations show that, for certain q profiles, the nonlinear interaction of tearing modes of different helicities leads to the rapid destabilization of other modes. The resulting effects and the time scale are consistent with the Tokamak disruption. DOE

N84-33194# Ames Lab., Iowa.
RELATION OF VERTICAL INTENSITY PROFILES FOR NEUTRAL ATOM LINES TO ANALYTE ATOMIZATION BEHAVIOR IN INDUCTIVELY COUPLED PLASMAS
R. S. Houk 1984 15 p refs Presented at Winter Conf. on Plasma Spectrochem., San Diego, Calif., 2 Jan. 1984
(Contract W-7405-eng-82)
(DE84-014126; IS-M-476; CONF-840101-3) Avail: NTIS HC A02/MF A01

Emission lines from neutral atoms exhibit their maximum intensities at observation heights that vary considerably from element to element. Vertical spatial profiles of neutral atom number density are derived from the corresponding experimental intensity profiles using a simple model based on a Boltzmann distribution of excited state populations. These number density profiles indicate that element to element differences in the height range in which analyte atomization and ionization occur are partly responsible for the normal temperature phenomenon noted above. The effects of forward power on the range of observation heights in which neutral atom lines peak is also described. DOE

N84-33195# Oak Ridge National Lab., Tenn. Fusion Energy Div.
ACCELERATED CONVERGENCE OF THE STEEPEST-DESCENT METHOD FOR MAGNETOHYDRODYNAMIC EQUILIBRIA
C. R. Handy (Atlanta Univ.) and S. P. Hirshman Jun. 1984 15 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013602; ORNL/TM-9133) Avail: NTIS HC A02/MF A01

Iterative schemes based on the method of steepest descent were used to obtain magnetohydrodynamic (MHD) equilibria. Such schemes generate asymptotic geometric vector sequences whose convergence rate improves through the use of the epsilon-algorithm. The application of this nonlinear recursive technique to stiff systems is discussed. In principle, the epsilon-algorithm is capable of yielding quadratic convergence and therefore represents an alternative to other quadratic convergence schemes requiring Jacobian matrix inversion. Because the damped MHD equations have eigenvalues with negative real parts (in the neighborhood of a stable equilibrium), the epsilon-algorithm is generally stable. Concern for residual monotonic sequences leads to consideration of alternative methods for implementing the algorithm. DOE

N84-33196# Los Alamos Scientific Lab., N. Mex.
THERMAL INSTABILITIES IN THE EDGE REGION OF REVERSED-FIELD PINCHES
J. Goedert and J. P. Mondt Apr. 1984 31 p Prepared in cooperation with Universidade Federal do Rio Grand do Sul, Porto Alegre, Brazil
(Contract W-7405-eng-36)
(DE84-013861; LA-10029-MS) Avail: NTIS HC A03/MF A01

The thermal stability of the edge region of reversed-field pinch plasma configurations is analyzed within the context of a two-fluid model. Two major sources of instability are identified in combination with a parallel electric field: either an electron temperature gradient and/or a density gradient that leads to rapid growth (of several to many ohmic heating rates) over a region of several millimeters around the mode-rational surfaces in the edge region. The basic signature of both instabilities is electrostatic. In the case of the density gradient mode, the signature relies on the effects of electron compressibility, whereas the temperature gradient mode is identified as the current-convective instability by taking the limit of zero diamagnetic drift, density gradient, thermal force, drift heat flux, and electron compressibility. DOE

N84-33197# GA Technologies, Inc., San Diego, Calif.
BEHAVIOR OF ORBITS OF TWO COUPLED OSCILLATORS
John M. Greene Jun. 1984 52 p refs Presented at the Intern. Conf. on Plasma Phys., Lausanne, Switzerland, 27 Jun. - 3 Jul. 1984 Submitted for publication
(Contract DE-AT03-84ER-53158; GA Proj. 3411)
(DE84-013379; GA-A-17593; CONF-840616-16) Avail: NTIS HC A04/MF A01

Considerable progress occurred in the past few years on the theory of two conservative, coupled, nonlinear oscillators. This is a very general theory, and applies to many equivalent systems. A typical problem of this class has a solution that is so complicated that it is impossible to find an expression for the state of the system that is valid for all time. However, recent results make it possible to determine the next most useful type of information. This is the asymptotic behavior of individual orbits in the limit of very long times. For example, it determines the stability of the motion. The key to present understanding is renormalization. DOE

N84-33198# GT-Devices, Alexandria, Va.
RESEARCH AND DEVELOPMENT OF A PLASMA JET MASS ACCELERATOR AS A DRIVER FOR IMPACT FUSION Final

Report, 6 May 1981 - 7 May 1984
S. A. Goldstein, D. A. Tidman, R. L. Burton, D. W. Massey, and N. K. Winsor 13 Jun. 1984 57 p refs
(Contract DE-AC05-81ER-10846)
(DE84-012940; DOE/ER-10846/T2) Avail: NTIS HC A04/MF A01

A ten module accelerator was designed, fabricated, and tested at projectile velocities up to 5 km/sec. It is shown that a projectile with mass less than a half gram is able to be accelerated by a succession of momentum kicks from plasma jets. The significance of this acceleration mechanism is that it is usable, in principle, to accelerate projectiles to several hundred kilometers per second as a driver for inertial fusion or other energy-related applications. A theoretical base was developed to understand the physics of plasma jet generation and the coupling of the jet momentum to the projectile. DOE

N84-33199# Oak Ridge National Lab., Tenn. Solid State Div.
SYNERGISTIC EFFECTS IN PLASMA SURFACE INTERACTIONS
J. B. Roberto and R. Behrisch (Max-Planck-Inst. fuer Plasmaphysik, Garching, West Germany) 1984 33 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14 May 1984 Submitted for publication
(Contract DE-AC05-84OR-21400)
(DE84-012346; CONF-840520-8) Avail: NTIS HC A03/MF A01

The possible synergistic effects which contribute to plasma surface interaction phenomena in fusion devices are reviewed. These effects include the influence of reactive ions, surface modifications, temperature, radiation damage, and external forces and fields on erosion yields, hydrogen retention and release, and other surface processes. The important synergistic effects are described in terms of surface and edge conditions encountered in present fusion devices and expected in future reactors. Priority data needs include the chemical erosion of graphite at high particle fluxes, melt-layer stability under disruption-induced eddy current forces, the influence of bulk neutron damage on hydrogen retention, and an in situ evaluation of synergistic effects in operating fusion devices. DOE

N84-33200# Sherbrooke Univ. (Quebec). Dept. of Chemical Engineering.
DYNAMICS OF HEAT, MASS AND MOMENTUM TRANSFER IN AN INDUCTIVELY COUPLED PLASMA Final Report
Maher I. Boulos 24 Feb. 1984 12 p
(Contract DE-AC02-77ER-04471)
(DE84-013499; DOE/ER-04471/T2) Avail: NTIS HC A02/MF A01

An overview is given of research accomplishments in improving understanding of the inductively coupled RF plasma which is used as an emission source in spectrochemical analysis. DOE

N84-33201# California Univ., Livermore. Lawrence Livermore Lab.
PHYSICS ISSUES IN MIRROR AND TANDEM MIRROR SYSTEMS
Richard F. Post 15 Jun. 1984 38 p refs Presented at the Intern. Conf. on Plasma Phys., Lausanne, Switzerland, 27 Jun - 3 Jul. 1984
(Contract W-7405-eng-48)
(DE84-013837, UCRL-90927; CONF-840616-17) Avail: NTIS HC A03/MF A01

Over the years the study of the confinement of high temperature plasma in magnetic mirror systems has presented researchers with many unusual physics problems. Many of these issues are by now understood theoretically and documented experimentally. With the advent of the tandem mirror idea, some new issues have emerged and are now under intensive study. These include: (1) the generation and control of ambipolar confining potentials and their effect on axial confinement and, (2) the combined influence of nonaxisymmetric magnetic fields (used to ensure MHD stability) and electric magnetic particle drifts on radial transport. Physics considerations associated with these two categories of issues will be reviewed, including concepts for the control of radial transport, under study or proposed. DOE

N84-33202# California Univ., Los Angeles. School for Engineering and Applied Science.
OBSERVATION OF ADVANCED PARTICLE REMOVAL RATES IN PUMP LIMITER SIMULATION EXPERIMENTS
D. M. Goebel and R. W. Conn May 1984 23 p refs Presented at the 6th Intern. Conf. on Plasma, Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14 May 1984
(Contracts DE-AM03-76SF-00034; DE-AC03-84ER-52104)
(DE84-014327; DOE/ER-52104/1; CONF-840520-14) Avail: NTIS HC A02/MF A01

The performance of particle removal schemes for density and impurity control in Tokamaks and mirror machines depends strongly on the plasma parameters and local recycling near the plasma neutralizier plates and gas pumping ducts. The relationship between plasma density, electron temperature, ion energy and gas flow and particle removal rate through a pumping duct located near a plasma neutralizer plate was experimentally investigated in the steady state plasma device PISCES. Results indicate that initially the particle removal by pumps at the end of the duct is proportional to the plasma flux to the plate. A nonlinear increase in the pumping rate occurs when the ionization mean free path for neutrals from the plate becomes less than the plasma radius. The transition from a transparent to an opaque plasma due to local ionization of the neutrals produced at the neutralizer plate greatly enhances the particle removal rate by recycling of the neutral gas as it flows away from the neutralizer plate or out of the pumping ducts. DOE

N84-33203# Sherbrooke Univ. (Quebec). Dept. of Chemical Engineering.
PLASMA-PARTICLE INTERACTION EFFECTS IN INDUCTION PLASMA MODELLING UNDER DENSE LOADING CONDITIONS
P. Proulx, J. Mostaghimi, and M. I. Boulos Jul. 1983 11 p refs Presented at the 6th Intern. Symp. on Plasma Chem., Montreal, 24-28 Jul. 1983 Submitted for publication Sponsored in part by Ministry of Education of the Province of Quebec, and by the Natural Sciences and Engineering Research Council, Canada
(Contract DE-AC02-77EV-04320)
(DE84-013388; CONF-8307121-1) Avail: NTIS HC A02/MF A01

The injection of solid particles or aerosol droplets in the fire-ball of an inductively coupled plasma can substantially perturb the plasma and even quench it under high loading conditions. This is mainly attributed to the local cooling of the plasma by the particles or their vapor cloud, combined with the possible change of the thermodynamic and transport properties of the plasma in the presence of the particle vapor. The state-of-the-art in the mathematical modelling of the induction plasma is reported. A particle-in-cell model is used in order to combine the continuum approach for the calculation of the flow, temperature and concentration fields in the plasma, with the stochastic single particle approach, for the calculation of the particle trajectories and temperature histories. Results are given for an argon induction plasma under atmospheric pressure in which fine copper particles are centrally injected in the coil region of the discharge. DOE

N84-33204# Oak Ridge National Lab., Tenn.
PROPAGATION AND ABSORPTION OF ELECTROMAGNETIC WAVES IN FULLY RELATIVISTIC PLASMAS
D. B. Batchelor, R. C. Goldfinger, and H. Weitzner May 1984 44 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013627; ORNL/TM-9075) Avail: NTIS HC A03/MF A01

The propagation and absorption of electromagnetic waves in a relativistic Maxwellian plasma are investigated by solving the uniform plasma dispersion relation. Both the Hermitian and the anti-Hermitian parts of the plasma conductivity tensor sigma are calculated relativistically. The Bessel functions occurring in sigma are not expanded, and many cyclotron harmonic terms are included at high temperatures. The dispersion relation is solved numerically

for perpendicular propagation, k (parallel) = 0, where the relativistic effects are maximum and are not masked by Doppler broadening, which has been more thoroughly investigated. It is found that relativistic broadening has a substantial effect on wave dispersion, shifting the extraordinary mode right-hand cutoff and the upper hybrid resonance to a higher magnetic field with increasing temperature. Above a critical temperature the cutoff disappears entirely. There is a broad range of temperatures, 20 keV approximately less than T sub e approximately less than 500 keV, for which the wave number k -perpendicular) differs significantly from both the cold plasma value and the vacuum value. This has important implications for ray tracing in relativistic plasmas. Wave damping rates are calculated and compared to results from a previous formulation using the Poynting theorem, in which only the Hermitian part of sigma is calculated relativistically. DOE

N84-33354# Massachusetts Inst. of Tech., Cambridge.
PLASMA DYNAMICS
George Bekefi, A. Bers, B. Coppi, T. H. Dupree, L. M. Lidsky, J. E. McCune, M. Porkolab, L. D. Smullin, R. H. Berman, G. Bertin et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 95-117 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-33205 Council for Scientific and Industrial Research, Pretoria (South Africa).
THE OCTAHEDRON-RHOMBODODECAHEDRON MORPHOLOGICAL SERIES OF SYNTHETIC DIAMOND CRYSTALS
A. I. Cepurov Oct. 1983 6 p refs Transl. into ENGLISH from Sverhtverdye Materialy (USSR), no. 4, 1982 p 6-8
(CSIR-Trans-1746) Avail: NTIS HC A02

Rhombododecahedral crystals are grown experimentally in an Ni/Mn/C system in order to establish whether or not an octahedron/rhombododecahedron morphological series exists in addition to the well known octahedron morphological series. A talcum cube containing a cylindrical graphite heater is used as working cell. Tablets consisting of Mg/OCC graphite interlayered with premolded eutectic Ni/Mn alloy are used as starting material. The experimentally obtained crystals are divided into regular octahedral crystals which grow towards the starting graphite discs and octahedron/rhombododecahedron morphological series, with crystallization proceeding in the direction of the metal. Examination of the face surface reveals no signs of dissolution, confirming rhombodecahedron face formation by growth as opposed to dissolution which establishes the continuity of the octahedron/rhombododecahedron series. M.A.C.

N84-33206 Council for Scientific and Industrial Research, Pretoria (South Africa).
EPITAXIAL CRYSTALLIZATION IN THE Te-HgTe-CdTe SYSTEM
Ja. F. Dub Oct. 1983 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR Neorgan. Materialy (USSR), v. 19, no. 1, 1983 p 59-61
(CSIR-Trans-1745) Avail: NTIS HC A02

The experimental production of an epitaxial Cd(x)Hg(1-x)Te layer of constant composition by crystallization of a solution of cadmium and mercury in tellurium is described. Epitaxial layers of Cd(x)Hg(1-x)Te solid solutions are obtained by growth from the liquid phase. The layer composition is related to the composition of the liquid phase. The growth layers have an alternating composition to a depth not exceeding 10 microns adjoining the sublayer while the composition of the rest of the growth layer remained constant. M.A.C.

N84-33207 Council for Scientific and Industrial Research, Pretoria (South Africa).
EPR INVESTIGATION OF INCLUSIONS IN CUBIC BORON NITRIDE CRYSTALS
A. N. Sokolov Nov. 1983 5 p refs Transl. into ENGLISH from Sverhtverdye Materialy (USSR), no. 1, 1981 p 15-17
(CSIR-Trans-1752) Avail: NTIS HC A02

Crystal synthesis to obtain superhard materials with specified physical and mechanical properties was examined. The effect on the growth system of the application of specific admixtures, the atoms of which are introduced into the nodes or internodes of crystal growth and its effect on the structure of the material obtained are studied. The components of the growth system used as a synthesis starter or activator and the reaction of products which occur in the reaction composition can have the same effect. X ray analysis of CBN (BNsf) shows a disorderly distribution of orientated free boron and fine crystalline magnesium oxide in the whole crystal volume and formation of Mg3 (BO3)2 is found in the growth system. E.A.K.

N84-33208 Department of the Navy, Washington, D. C.
METHOD FOR FABRICATING MNOS STRUCTURES UTILIZING HYDROGEN ION IMPLANTATION Patent
N. S. Saks, inventor (to Navy) Issued 8 May 1984 5 p Supersedes AD-D009994
(AD-D011123; US-Patent-4,447,272; US-Patent-Appl-SN-443828; US-Patent-Class-148-1.5) Avail: US Patent & Trademark Office CSCL 20/12

An improved method for reducing the density of electronic trapping states and fixed insulator charge in the thin oxide layer of an MNOS structure is discussed. The method includes the steps of implanting hydrogen ions in field region of the oxide layer and annealing the MNOS structure at 400 deg C to cause the ions to diffuse laterally into the gate region of the oxide layer. Author (GRA)

N84-33209 Department of the Air Force, Washington, D.C.
ELECTRODING OF MULTI-LAYERED EPITAXIAL STRUCTURES Patent
G. D. Robertson, Jr., inventor (to Air Force) Issued 15 May 1984 5 p Supersedes AD-D010495
(AD-D011137; US-Patent-4,448,645; US-Patent-Appl-SN-512847; US-Patent-Class-204-15) Avail: US Patent & Trademark Office CSCL 20/12

To locate the very thin transparent low-resistivity planar electrode layers in a multilayer epitaxial structure for an electrooptic tunable filter, one edge of the stack is covered with a dielectric, and a long diagonal strip opening is made through the dielectric. A common metal electrode is formed on the opposite edge of the stack. The edge with the strip opening is immersed in a plating solution and potential applied at the common electrode so that a metal deposit is formed at the exposed location of each low-resistivity layer along the strip opening. Author (GRA)

N84-33210*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Physics.
PARTICLE ENVIRONMENT Final Report, 5 Nov. 1981 - 4 Nov. 1982
W. L. Gordon and R. W. Hoffman Sep. 1984 24 p refs (Grant NsG3-235)
(NASA-CR-173888; NAS 1.26:173888) Avail: NTIS HC A02/MF A01 CSCL 20L

The charging and discharging characteristics of an electrically isolated solar array segment were studied in order to simulate discharges seen during geomagnetic substorms. A solar array segment was floated while bombarded with monoenergetic electrons at various angles of incidence. The potentials of the array surface and of the interconnects were monitored using Trek voltage probes to maintain electrical isolation. A back plate was capacitively coupled to the array to provide information on the characteristics of the transients accompanying the discharges. Several modes of discharging of the array were observed at relatively low differential and absolute potentials (a few kilovolts).

A relatively slow discharge response in the array was observed, discharging over one second with currents of nanoamps. Two types of faster discharges were also seen which lasted a few hundredths of a millisecond and with currents on the order of microamps. Some results indicate an electron emission process associated with the arcs. Author

N84-33211*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FET CHARGE SENSOR AND VOLTAGE PROBE Patent Application
Paul A. Robinson, Jr., inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 16 Aug. 1984 14 p
(Contract NAS7-100)
(NASA-Case-NPO-16045-1; NAS 1.71:NPO-16045-1;
US-Patent-Appl-SN-641146) Avail: NTIS HC A02/MF A01 CSCL 20L

A simple, light, power-efficient solid state charge sensor usable for a variety of purposes in a variety of space environments is provided. This sensor comprises a mosfet structure provided with a biased gate formed under an insulator several times thicker than a typical mosfet passivating layer. Several such sensors having different gate materials and/or insulator thicknesses may be stacked to provide a particle spectrometer. Author

N84-33212# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MANUFACTURE AND CHARACTERIZATION OF Pb(1-X)Sn(X)Te PHOTOCONDUCTORS M.S. Thesis [FABRICACAO E CARACTERIZACAO DE DETETORES FOTOCONDUTIVOS DE Pb(1-X)Sn(X)Te]
Cesar Boschetti Mar. 1984 87 p refs In PORTUGUESE; ENGLISH summary
(INPE-3045-TDL/157) Avail: NTIS HC A05/MF A01

A general account of the properties, growing technology and annealing of lead-tin-telluride single crystals is given. Photoconductors were made for the 8 to 14 micron. spectral range and responsivity, detectivity and spectral response measurements showed satisfactory results. Improvement in the growing and annealing of the single crystals promise good performance in the near future. Author

N84-33213*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POLYCRYSTALLINE SILICON STUDY: LOW-COST SILICON REFINING TECHNOLOGY PROSPECTS AND SEMICONDUCTOR-GRADE POLYCRYSTALLINE SILICON AVAILABILITY THROUGH 1988
E. N. Costogue, R.R. Ferber, R. Lutwack, J. H. Lorenz, and R. Pellin 30 May 1984 46 p refs
(Contracts NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-173897; JPL-Pub-84-41; NAS 1.26:173897;
DOE/ET-20356/17) Avail: NTIS HC A03/MF A01 CSCL 20B

Photovoltaic arrays that convert solar energy into electrical energy can become a cost effective bulk energy generation alternative, provided that an adequate supply of low cost materials is available. One of the key requirements for economic photovoltaic cells is reasonably priced silicon. At present, the photovoltaic industry is dependent upon polycrystalline silicon refined by the Siemens process primarily for integrated circuits, power devices, and discrete semiconductor devices. This dependency is expected to continue until the DOE sponsored low cost silicon refining technology developments have matured to the point where they are in commercial use. The photovoltaic industry can then develop its own source of supply. Silicon material availability and market pricing projections through 1988 are updated based on data collected early in 1984. The silicon refining industry plans to meet the increasing demands of the semiconductor device and photovoltaic product industries are overviewed. In addition, the DOE sponsored technology research for producing low cost polycrystalline silicon, probabilistic cost analysis for the two most promising production processes for achieving the DOE cost goals, and the impacts of the DOE photovoltaics program silicon refining research upon the commercial polycrystalline silicon refining industry are addressed. S.B.

N84-33214# North Carolina State Univ., Raleigh.
PHYSICAL PROPERTIES OF CdTe FILMS GROWN BY HOT-WALL AND MOLECULAR BEAM TECHNIQUES Final Report, 1 Mar. 1981 - 28 Feb. 1984
J. F. Schetzina Jun. 1984 6 p
(Contract DAAG29-81-K-0055)
(AD-A143180; ARO-17772.11-EL) Avail: NTIS HC A02/MF A01 CSCL 20/2

Results have shown that MBE and hotwall MBE techniques can be employed to grow high quality epitaxial CdTe films, suitable for use as substrates for Hg CdTe film growth, using alternative substrates. In particular, CdTe / (0001) sapphire and CdTe / (100) GaAs provide viable alternatives to bulk CdTe for use as substrates in the 2-5 micrometer and 8-14 micrometer IR regions, respectively. The most recent results indicate that layers grown by hotwall MBE are at least comparable to and, perhaps, superior to MBE grown films. This is an important finding because it implies that the CdTe epitaxial film growth process on these alternatives substrates may be scaled-up to meet production needs for substrate using batch processing techniques. Author (GRA)

N84-33215# Naval Academy, Annapolis, Md. Dept. of Physics.
ANOMALOUS PRESSURE DEPENDENCE OF DIPOLAR RELAXATION TIMES IN RARE EARTH DOPED LEAD FLUORIDE Interim Report
J. J. Fontanella, M. C. Wintersgill, D. R. Figueroa (Simon Bolivar Univ., Caracus, Venezuela), A. V. Chadwick (Kent Univ., Canterbury, England), and C. G. Andeen (Case Western Reserve Univ., Cleveland, Ohio) May 1984 22 p
(NR Proj. 627-793)
(AD-A143201; TR-13) Avail: NTIS HC A02/MF A01 CSCL 07/4

Electrical relaxation measurements at high pressures have been carried out on lead fluoride doped with lanthanum and cerium. A single, strong relaxation peak is observed and the relaxation time decreases with pressure. This is contrary to the behavior exhibited by all known relaxations and can be explained by attributing the relaxation to a substitutional trivalent rare earth compensated either by an interstitial fluorine ion with a soft attempt mode or by an electron. Author (GRA)

N84-33216# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
LOW TEMPERATURE EPITAXIAL DEPOSITION OF SILICON BY PLASMA ENHANCED CVD (CHEMICAL VAPOR DEPOSITION) Final Technical Report, 1 Jun. 1981 - 30 Nov. 1983
L. R. Reif 1 Jun. 1984 12 p
(Contract DAAG29-81-K-0087)
(AD-A143208; ARO-18083.5-EL) Avail: NTIS HC A02/MF A01 CSCL 13/8

A reactor system has been developed to deposit specular epitaxial silicon films at temperatures as low as 620 C using a low pressure chemical vapor deposition process both with and without plasma enhancement. This represents the lowest silicon epitaxial deposition temperature ever reported for a thermally driven chemical vapor deposition process. Experiments performed at 775 C indicate that the predeposition in-situ cleaning of the substrate surface is the critical step in determining whether epitaxial deposition will occur. Surface cleaning in these experiments was done by sputtering in an argon plasma ambient at the deposition temperature while applying a dc bias to the susceptor. This is the lowest pre-epitaxial cleaning temperature ever reported for a thermally driven chemical vapor deposition. Author (GRA)

N84-33217# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PROXIMITY EFFECTS OF SUPERCONDUCTING MULTILAYER FILM
C. Xueyu and Y. Daole 10 Jul. 1984 11 p Transl. into ENGLISH from Wuli Xuebao (China), v. 30, no. 5, May 1981 p 700-704

(AD-A143255; FTD-ID(RS)T-0717-84) Avail: NTIS HC A02/MF A01 CSCL 20/3

The proximity effects of superconducting multilayer films composed of different metals are considered. The relationship between the critical temperature of a superconducting multilayer film with strong heterogeneity and its geometric structure is given. R.S.F.

N84-33218# Rome Air Development Center, Griffiss AFB, N.Y.
PREPARATION OF HIGH PURITY Ga(X)In(1-x) BY THE VPE-HYDRIDE METHOD WITH A GALLIUM-INDIUM ALLOY SOURCE
T. E. Erstfeld and K. P. Quinlan Feb. 1984 25 p
(AF Proj. 2306)
(AD-A143275; RADC-TR-84-16) Avail: NTIS HC A02/MF A01 CSCL 20/2

The preparation of epitaxial layers of the ternary, GaxIn1-xAs, by the VPE-Hydride technique using a Ga-In alloy source is described. The alloy composition necessary to produce Ga0.47In0.53 As was found to be 12.2 mole percent Ga-87.8 mole percent In at source, mixing, and deposition temperatures of 800, 850, and 700 C, respectively. Maximum growth rates of the order of 0.1 micrometer/min were observed when the source HC1 had a flow rate of 2.3 cc/min. The In content increases slightly with the number of runs using the same alloy. An increase in deposition temperature from 700 to 750 C exhibited no effect on the composition of the GaxIn1-x As layer. The electrical properties of the epitaxial layers obtained compare favorably with other growth methods, n = 2.8 x 10 to the 15th power/cu. cm (300K) and mu = 8852 sq cm/V-sec (300K). The study illustrates that the use of an alloy in the VPE-Hydride technique using a single-barrel reactor is a viable method to grow epitaxial layers of Ga0.47 In0.53As. GRA

N84-33219# Ohio State Univ., Columbus.
NEW GALLIUM PRECURSORS FOR THE FORMATION OF HIGH PURITY GALLIUM ARSENIDE BY METAL ORGANIC VAPOR PHASE DEPOSITION Final Report, 1 May 1983 - 30 Apr. 1984
E. P. Schram Jun. 1984 16 p
(Grant AF-AFOSR-0142-83)
(AD-A143361; AFOSR-84-0586TR) Avail: NTIS HC A02/MF A01 CSCL 07/2

The reduction of gallium trichloride monoammonia adduct with lithium hydride affords lithium trichlorohydrido gallate whereas the non-coordinated trichloride affords the known species, lithium tetrahydrido gallate. Attempts to prepare the ammonia adduct of gallane via lithium tetrahydrido gallate and ammonium chloride resulted in decomposition with hydrogen evolution. Exploratory investigation geared towards the formation of gallium perfluoroalkyls, via discharge reactions involving hexafluoroethane and trifluoroiodomethane, resulted in the gallium reduction of the pyrex reactors - construction of quartz reactors is therefore necessitated. Author (GRA)

N84-33220# Oregon Univ., Eugene. Dept. of Physics.
RELATIVISTIC CALCULATIONS AND MEASUREMENTS OF ENERGIES, AUGER RATES, AND LIFETIMES Final Technical Report, 15 Jun. 1983 - 14 Feb. 1984
B. Crasemann 14 Feb. 1984 15 p
(Contract F49620-83-K-0020)
(AD-A143423; AFOSR-84-0571TR) Avail: NTIS HC A02/MF A01 CSCL 20/10

This project is devoted to the study of the structure and dynamics of deep hole states in atoms and of few-electron systems. During the reporting period, work has been completed on the gauge dependence of atomic inner-shell transition rates, M X-ray emission rates in Dirac-Fock approximation, Auger and radiative deexcitation in P4+ ions, inelastic X-ray scattering cross sections of neon, on two book-length monographs on inner-shell processes, and on two reviews of atomic physics with synchrotron radiation. Threshold excitation phenomena in deep inner shells are being explored through gas-phase electron spectrometry with synchrotron radiation, and investigations of the resonant Auger Raman effect and post-collision interaction are being pursued. GRA

N84-33221# Auburn Univ., Ala.
THEORY OF THE ELECTRONIC PROPERTIES OF MERCURY-CADMIUM-TELLURIDE ALLOYS Final Report, 31 Jun. 1981 - 31 Dec. 1983
A. B. Chen and A. Sher 21 Feb. 1984 7 p
(Contract F49620-81-K-0012)
(AD-A143426; AFOSR-84-0549TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

An accurate band-structure theory for semiconductor alloys was achieved. It has been successfully applied to Mercury-Cadmium-Telluride alloys (MCT), and is being extended to III-V and other II-VI semiconductor alloys. As a result of this research, ten papers have been published. Several other papers and one book are in progress. The most important finding was the origin of the major disorder and its effects on different parts of the band structure. The large s-energy fluctuation between the Hg and Cd sites was found to cause a large smearing in the density of states about 5 eV below the top of the valence band, but it produced very little bowing and scattering for the states near the band gap. A detailed study of these facts accounts for the lattice instability of MCT and its very high electron mobility. Another significant result is that, while Cd weakens a neighboring Hg-Te bond, Zn strengthens it. Such structural studies may help resolve the adverse structural difficulties affecting MCT as an infrared material. GRA

N84-33222# Hughes Research Labs., Malibu, Calif.
BASIC PROBLEMS IN InP TECHNOLOGY Final Report, 16 Nov. 1979 - 31 Mar. 1983
K. V. Vaidyanathan and H. L. Dunlap Mar. 1984 74 p
(Contract F49620-82-C-0040)
(AD-A143456; AFOSR-84-0583TR) Avail: NTIS HC A04/MF A01 CSCL 20/12

Procedures for evaluating the thermal stability of bulk semi-insulating InP have been developed. Determination of the concentrations in semi insulating InP is a major analytical problem. Preliminary SIMS (secondary ion mass spectrometry) measurements show that significant redistribution of Fe can occur during high temperature processing. Severe degradation can occur in ion-implanted InP samples annealed with SiO2 and encapsulated at temperatures of 750 C. The use of phosphosilicate glass dramatically reduces such surface degradation. Energy dispersive X-ray analysis (EDAX) shows that the loss of P at the surface is the cause of such degradation. GRA

N84-33223# Montana State Univ., Bozeman. Dept. of Physics.
QUANTUM STRUCTURE OF ADSORBATES ON SEMICONDUCTOR SURFACES Final Report, 1 Jul. 1982 - 31 Dec. 1983
Gerald J. Lapeyre Dec. 1983 28 p
(Grant AF-AFOSR-0267-82)
(AD-A143465; AFOSR-84-0584TR) Avail: NTIS HC A03/MF A01 CSCL 20/10

Polarization-dependent angle-resolved photoemission spectroscopy with synchrotron radiation was performed for Ge adatom on GaAs(110) surfaced in the monolayer regime. Chemisorbed states at the gamma point in the Brillouin zone were observed about 6.8 eV below the valence band maximum. The states are attributed to chemisorption states that are precursors ot Ge/GaAs heterojunction interface states which are theoreticallY predicted. A special low temperature UHV manipulator was constructed and used to perform oxygen and Co physisorbtion experiments on GaAs(110) at about 45 K. GRA

N84-33224# California Univ., Los Angeles.
ELECTRON LOCALIZATION AND SUPERCONDUCTIVITY OF VERY THIN EPITAXIALLY GROWN ag FILMS ON ge(001)
J. R. Lince, R. S. Williams, and P. M. Chaikin Jul. 1984 12 p
(Contract N00014-83-K-0612)
(AD-A143469; TR-3) Avail: NTIS HC A02/MF A01 CSCL 20/3

Transport properties of very thin (2.5 monolayer) films of Ag

epitaxially grown on clean Ge(001) substrates are reported. The films consists of a monolayer coverage plus isolated three-dimensional islands. Below approx. 70 K, the conductivity is dominated by the metal film and displays the temperature and electric and magnetic field dependences characteristic of metallic weak localization in two dimensions. Below approx. 2 K, the resistance drops rapidly in a manner resembling an incomplete superconducting transition. The resistance is restored by application of a magnetic field of approx. 20 K Gauss 0.6 K. Author (GRA)

N84-33225# Massachusetts Inst. of Tech., Cambridge. National Magnet Lab.
IMPURITY AND DEFECT CHARACTERIZATION IN EPITAXIAL GaAs InP AND THE TERNARY AND QUATERNARY COMPOUND SEMICONDUCTORS Final Scientific Report, 1 Aug. 1978 - 31 Jul. 1983
K. J. Button and M. N. Afsar 4 May 1984 8 p
(Grant AF-AFOSR-3708-78)
(AD-A143551; AFOSR-84-0585TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

Experimental techniques were developed and used for the unambiguous identification of donors in high-purity epitaxial GaAs, InP and related compounds. Magnetic fields up to 20 T and high-resolution submillimeter spectroscopy were used to distinguish the Zeeman transitions 1s 2p(m=1) of each different donor and to describe the dependence of the line shape on field intensity. Transmutation doping was used to distinguish Se and Ge donors, molecular beam epitaxy to distinguish Sn. These methods were extended to InGaAs near millimeter wavelengths. Finally, the magnetic field dependence of the spin doublet in GaAs was measured. GRA

N84-33226# Rochester Univ., N. Y. Dept. of Chemistry.
FORMATION OF ELECTRON-HOLE PAIRS IN A SEMICONDUCTOR BY VIBRATIONALLY-EXCITED MOLECULES
I. Last and T. F. George Jul. 1984 43 p
(Contract N00014-80-C-0472)
(AD-A143552; TR-52) Avail: NTIS HC A03/MF A01 CSCL 20/12

Both one-dimensional and three-dimensional models are presented for the collision of a vibrationally-excited molecule with a semiconductor surface, where the transfer of vibrational energy leads to the formation of electron-hole pairs. The transition probability P is calculated as a function of the molecule-surface distance for real two systems, HCl + InSb and HCl + PbSe, as well as for some model systems with different values of parameters. While P generally increases as the distance decreases, there are some minima at intermediate distances. The overall probability is obtained as an approximate integral of P over the distance, and for thermal collisions values of a few percent are obtained. Such values are high enough for an experimental observation of electrical conductivity due to electron-hole pair formation. Author (GRA)

N84-33227# University of Northern Illinois, De Kalb. Dept. of Physics.
STUDIES OF STRUCTURAL PROPERTIES AND THEIR RELATIONSHIP TO CRITICAL PARAMETERS IN SUPERCONDUCTING MATERIALS Final Report, 1 Oct. 1979 - 31 Dec. 1983
C. W. Kimball 28 Feb. 1984 33 p
(Grant AF-AFOSR-0010-80)
(AD-A143556; Rept-82-219; AFOSR-84-0550TR) Avail: NTIS HC A03/MF A01 CSCL 20/3

The project comprised an experimental study of the electronic and vibrational properties of superconducting materials by means of Moesbauer spectroscopy. From the temperature dependence of the Mossbauer parameters of tin in the oxide superconductor Ba(PbO.67SnO.O3)BiO.3O3, phonon softening, characteristic of displacive transitions, was found to take place above the superconducting transition temperature. This observation is hence important for understanding the superconducting properties of the perovskite compounds. The Mossbauer effect at Sb121 in BaPb1-x(Bi,Sb)xO3 shows that Sb is 5+. The range of stability of the perovskite compounds was determined in the ternary systems Ba(Pb-Sn-Bi)O3 and Ba(Pb-Sb-Bi)O3. The composition dependence of the superconducting transition temperature was determined for both ternary systems. Conversion Electron Mossbauer Spectroscopy has been applied to the study of Nb3Sn superconducting films. This total has been found to provide a unique probe of the electronic and vibrational properties of thin film materials. GRA

N84-33228# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical Computer and Systems Engineering.
NON-DESTRUCTIVE TESTING OF SEMICONDUCTORS USING SURFACE ACOUSTIC WAVE Final Technical Report
B. Davari and P. Das 31 Dec. 1983 274 p
(Grants AF-AFOSR-3426-77; AF-AFOSR-0281-82)
(AD-A143559; AFOSR-84-0582TR) Avail: NTIS HC A12/MF A01 CSCL 20/12

The major emphasis of this report is on a new and novel surface acoustic wave (SAW) device which has been developed under this grant for use in the nondestructive determination of the electronic properties of semiconductors. The technique uses surface acoustic waves on a piezoelectric substrate. The electric field associated with the SAW interacts with free carriers of a semiconductor placed near the piezoelectric surface. The interaction generates detectable currents in the semiconductor and attenuates the SAW. By observing these effects while varying external parameters such as temperature, applied acoustic power, SAW frequency, semiconductor surface irradiation and bias voltage, the desired information is obtained. The properties that can be determined by this non contact technique include the bulk and surface conductivity, generation lifetime, surface recombination velocity, the location in the energy gap of traps, surface states, and interface states, trap emission and absorption times and storage times in the depletion layer. GRA

N84-33229# Department of the Air Force, Washington, D.C.
PROCESS FOR THE EPITAXIAL DEPOSITION OF III-V COMPOUNDS UTILIZING A BINARY ALLOY AS THE METALLIC SOURCE Patent Application
K. P. Quinlan, inventor (to Air Force) Filed 6 Oct. 1983 17 p
(AD-D011097; US-Patent-Appl-SN-593603) Avail: NTIS HC A02/MF A01 CSCL 20/12

The present invention relates in general to a process for depositing epitaxial films of Group III-V semiconductor substrate crystallographically compatible therewith. In a more particular aspect, this invention relates to a process for depositing an epitaxial film of a ternary III-V compound by a vapor phase epitaxy-hydride techniques using a binary III-V alloy, as the metallic sources. The resulting epitaxial structures find particular utility in the fabrication of light emitting diodes, field effect transistors, and double heterostructure lasers. GRA

N84-33230# Los Alamos Scientific Lab., N. Mex.
ANOMALOUS SURFACE IMPEDANCE IN REENTRANT FERROMAGNETIC SUPERCONDUCTORS
C. Y. Huang, G. Kozlowski (Alberta Univ., Edmonton), F. Mancini (Salerno Univ., Italy), M. B. Maple (California Univ., San Diego, La Jolla), H. Matsumoto (Alberta Univ., Edmonton), C. E. Olson, H. Umezawa (Alberta Univ., Edmonton), and J. P. Whitehead (Alberta Univ., Edmonton) May 1984 3 p refs Presented at 17th Intern. Conf. on Low Temp. Phys., Kahlsruhe, West Germany, 15 Aug. 1984
(Contract W-7405-eng-36)
(DE84-012634; LA-UR-84-1525; CONF-840842-17) Avail: NTIS HC A02/MF A01

For ErRh4B4, owing to the critical spin fluctuations just above T/sub s/ (greater than T/sub c2/), the critical temperature at which surface ferromagnetism appears, the reciprocal penetration depth, lambda (-1), decreases smoothly as T decreases toward T/sub s/. For ErO 5HoO 5Rh4B4, the decrease in lambda(-1) for F greater than T/sub c2/ is very small, and lambda(-1) decreases abruptly at T/sub c2/. DOE

N84-33231# Ames Lab., Iowa.
NEW MATERIALS FROM HIGH TEMPERATURE SYNTHESIS

J. D. Corbett 2 Apr. 1984 17 p refs Presented at 4th Intern. Conf. on High Temperature and Energy Related Mater., Santa Fe, N. Mex., 2 Apr. 1984 Submitted for publication
(Contract W-7405-eng-82)
(DE84-014125; IS-M-491; CONF-8404110-6) Avail: NTIS HC A02/MF A01

Over 40 types of metal rich compounds are synthesized by high temperature reactions. These are found in binary and ternary systems of the early (group III-VI) transition and lanthanide elements with the nonmetals Cl, Br, I, O, S, Se or Te. Metal/metal bonding is characteristic of all the structures. These are conveniently organized in terms of the presence of discrete clusters of four to six metal atoms or their condensation products in the form of extended clusters, infinite chains of clusters sharing faces or edges, or double metal layered sheets. All the metal structures are well bound by nonmetals in relatively specific ways. Several recent discoveries also involve small nonmetal atoms interstitially bound within the metal units. A range of examples are discussed and illustrated. Some developing concepts and principles involving structural, bonding and electronic regularities and effects and some of the experimental aspects are also considered. DOE

N84-33232# Rockwell International Corp., Anaheim, Calif.
MAXIMUM SUPERCOOLING IN LIQUID 3He-4He MIXTURES NEAR THE TRICRITICAL POINT
Dipen N. Sinha and James K. Hoffer (Los Alamos National Lab.) 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15 Aug. 1984
(Contract W-7405-eng-36)
(DE84-010076; LA-UR-84-904; CONF-840842-3) Avail: NTIS HC A02/MF A01

Measurements of supercooling in liquid He(3)-He(4) mixtures near the critical point are presented. The reduced temperature range 0.001 < epsilon identical to (1 - T/Tsub t/) < 0.01 was investigated for three different rates of cooling using a pressure-quench technique. For epsilon 0.012, the maximum supercooling was found to be a function of the cooling rate. Comparisons with data in organic binary mixtures are given. DOE

N84-33233# Los Alamos Scientific Lab., N. Mex.
DYNAMICAL SCALING IN 3He-4He LIQUID MIXTURES
James K. Hoffer and Dipen N. Sinha (Rockwell International, Anaheim, Calif.) 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15 Aug. 1984
(Contract W-7405-eng-36)
(DE84-010072; LA-UR-84-905; CONF-840842-4) Avail: NTIS HC A02/MF A01

Light scattering data in decomposing He(3)-He(4) mixtures yield the normalized dynamic structure factor anti S(k,t) and verify the dynamic scaling hypothesis anti S(k,t) = k1(-3) F (k/k1), where k1 is the first moment of the (unnormalized) structure factor S(k,t), and F(x) is a time independent shape factor. Assuming that scaling is also valid for S(k,t), we trace the path of the quench in the temperature-composition plane. DOE

N84-33234# Stanford Univ., Calif. Synchrotron Radiation Lab.
DIAMOND SURFACE: ATOMIC AND ELECTRONIC STRUCTURE Ph.D. Thesis
Bradford B. Pate Jan. 1984 241 p refs Sponsored in part by NSF, and the National Inst. of Health.
(Contract DE-AC03-82ER-13000)
(DE84-013518; SSRL-84/04) Avail: NTIS HC A11/MF A01

The atomic and electronic structure of diamond surfaces were studied. Graphite studies are discussed and compared with the diamond results. The interaction of hydrogen with the diamond surface is examined using results from vibrational high resolution low energy electron loss spectroscopy and photon stimulated ion desorption (PSID) yield at photon energiesnear the carbon k-edge. Both EELS and PSID verify that the mechanically polished 1 x 1 surface is hydrogen terminated and also that the reconstructed surface is hydrogen free occupied intrinsic surface states and a surface chemical shift to lower binding energy of the carbon 1s level on the hydrogen free reconstructed surface are observed. It is found that atomic hydrogen is reactive with the reconstructed surface, while molecular hydrogen is relatively inert. Exposure of the reconstructed surface to atomic hydrogen results in chemisorption of hydrogen and removal of the intrinsic surface state emission in and near the band gap region. DOE

N84-33235# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Division.
RADIAL DISTRIBUTION FUNCTION AS AN ANALYSIS TECHNIQUE M.S. Thesis
A. W. Pearson May 1984 70 p refs
(Contract DE-AC03-76SF-00098)
(DE84-013242; LBL-16604) Avail: NTIS HC A04/MF A01

Diffraction patterns for Cu as found in a perfect fcc lattice were generated for various particle sizes and shaps using a computer model based on the Debye-Sum. These patterns were Fourier transformed to yield the radial distribution function G(R) = 4(PI)R(rho(R)-rho0). This function was studied in relation to five variables: (1) particle size, (2) particle shape; (3) scattering vector termination; (4) the influence of small angle scattering due to sample size; and (5) effect of vibrational atomic displacements. It is found that particle sizes of up to 30A influence G(R) as related to determination of the first coordination shell. The effect of volume scattering displaces the G(R) curve negatively, but neither peak position nor area are affected. The measurement of rho0 is affected and the effective rho0 present with SAXS removed is considered when calculating coordination shells. DOE

N84-33236# Brookhaven National Lab., Upton, N. Y. Div. of Metallurgy and Materials Science.
MECHANISMS INVOLVED IN THE GLOW-DISCHARGE DEPOSITION OF DOPED HYDROGENATED AMORPHOUS SILICON
F. J. Kampas and P. E. Vanier 1984 5 p refs Presented at the Intern. Topical Conf. on Transport and Defects in Amorphous Semiconductors, Bloomfield Hills, Mich., 22 Mar. 1984
(Contract DE-AC02-76CH-00016)
(DE84-013124; BNL-34779; CONF-8403132-1) Avail: NTIS HC A02/MF A01

The dependence of the Fermi level on discharge phosphine concentration can be understood using a simple model of the doping process, in which charged dangling bonds during deposition are the precursors of all the dangling bonds in the deposited film. DOE

N84-33237# Washington Univ., Seattle. Dept. of Physics.
X-RAY SPECTROSCOPY OF SOLIDS UNDER PRESSURE Annual Progress Report, Aug 1983 - Jul. 1984
Robert L. Ingalls 23 Mar. 1984 7 p refs
(Contract DE-AT06-83ER-45038)
(DE84-013790; DOE/ER-45038/1) Avail: NTIS HC A02/MF A01

X-ray absorption studies of several materials was a function of pressure were performed. Of particular interest was the extended X-ray abbsorption fine structure (EXAFS) and X-ray absorption near edge structure. (XANES) Materials studied inlcude the alkali halides, NaBr and RbCl, zinc blend semiconductors ZnSe and CuBr and mixed-valence materials SmS and SmSe. In the former, the volume dependence of bond lengths and their mean square fluctuations were determined from the EXAFS. In the latter materials, the XANAES exhibited the pressure induced change from the Sm(2+) configuration to Sm(3+). DOE

N84-33238# Washington Univ., Seattle. Dept. of Electrical Engineering.
NUCLEAR MAGNETIC RESONANCE STUDIES OF ION MOTION IN SOLID ELECTROLYTES Annual Report, 1 Apr. 1983 - 31 Mar. 1984
J. L. Bjorkstam Dec. 1983 24 p refs
(DE84-013846; DOE/ER-10416/5) Avail: NTIS HC A02/MF A01

Progress is reported on the following studies. The microscopic nature of low lying excitations in disordered materials (primarily beta-aluminas and vitreous electrolytes) was studied. The focus of this work was a comparison of analytical models for phonon-

disorder mode interactions with available low temperature NMR relaxation data in the beta-alumina family and borate glasses. Contributions to the phenomenology of the glass transition were made. The relationship between thermal stability and conductivity in glass systems was studied through a comparison of NMR data, collected near the glass transition in several borate glasses, with free-volume and liquid-phonon models. Another aspect of the study was an investigation of the relationship between ion diffusion and structural stability. Specific materials investigations focused upon borophosphate glasses, and single crystal, powder and dispersed phase samples of lithium iodide monohydrate. The effort was directed primarily toward phenomenology of the glass transition. DOE

N84-33239# Wisconsin Univ., Madison. Dept. of Metallurgical and Mineral Engineering.
LOCAL ELECTRONIC PROPERTIES OF SEMICONDUCTOR SURFACES AND INTERFACES Final Report
Max G. Lagally May 1984 6 p
(Contract DE-AC02-77ER-04435)
(DE84-013608; DOE/ER-04435/10) Avail: NTIS HC A02/MF A01

Properties of selected compound semiconductor surfaces and interfaces were investigated. A combination of low energy electron diffraction, Auger electron spectroscopy line shape analysis, and ultraviolet and X-ray photoelectron spectroscopy were used. Surfaces were prepared primarily by cleavage of bulk crystals of valence type compounds. Surface and interfacial local chemical properties were investigated, and the specific-specific density of filled states is emphasized. Empty state densities and morphological and chemical properties of sputter deposited thin films are measured. DOE

N84-33240# Nebraska Univ., Lincoln. Dept. of Chemistry.
OPTICAL AND ELECTRICAL PROPERTIES OF ORGANIC DYE CRYSTALS Final Report
C. J. Eckhardt Feb. 1984 7 p
(Contract DE-FG02-79ER-10535)
(DE84-014930; DOE/ER-10535/T1) Avail: NTIS HC A02/MF A01

Crystal spectra of three dyes were studied. The dyes are: 3,3'-diethylthiacyanine bromide, pseudoisocyanine and the squarylium dye, 2,4-bis (2-hydroxy-4-diethylaminophenyl)-1, 3-cyclobutadienediylium-1, 3-diolate (HBAPS). Polymorphs were discovered for the latter two dyes and their spectra were investigated. HBAPS showed markedly different spectra for its monoclinic and triclinic forms. The specular reflection spectra of the two crystal forms were successfully fit using molecular exciton-polariton theory employing lattice sums based on a point-charge appproximation. A three-oscillator model for a Gaussian frequency-dependent damping was successful in fitting the spectra. The thiacyanine and pseudoisocyanine dye crystals showed normal quasi-metallic reflection spectra. That of the thiacyanine was found to closely resemble the H-band (dimer) spectra of the dye aggregate in solution. DOE

N84-33241# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
DRIFT MOBILITIES BY TIME-OF-FLIGHT METHODS AND TIME-DEPENDENT PHOTOTRANSPORT IN THE NANOSECOND REGIME IN AMORPHOUS SEMICONDUCTORS Final Report
P. B. Kirby and W. Paul May 1984 48 p refs
(Contract DE-AC02-82ER-12064)
(DE84-014906; DOE/ER-12064/2) Avail: NTIS HC A03/MF A01

Carrier transport in amorphous semiconductors usually appears to be of the type labelled dispersive: carriers conduct for a time, are temporarily immobilized at a trap, and then re-excited to conduct again. We have developed very sensitive apparatus to study such effects in amorphous hydrogenated silicon, and have shown that a number of experimental conditions must be satisfied before the data can e successfully analyzed to give acceptable parameters of the amorphous semiconductor. The dispersion parameters from a time-of-flight experiment accurately follow the predictions of a multiple trapping and release process for a-Si:H when all prscautions are taken. Integration of the current transients yields values of the ((MU) tau) products for samples with a wide range of deep state densities. These have been studied as a function of phosphorus doping in both sputtered and low-discharged material. The results show that phosphorus doping changes the gap state density just below the conduction band transport level and also changes the density of dangling bond defects. Extreme sensitivity of the (MU) tau product of both electrons and holes to the position of the Fermi level with respect to the energy of the dangling bond has been conclusively demonstrated. DOE

N84-33242# Northwestern Univ., Evanston, Ill.
DEFECT CLUSTERS AND ELECTRICAL PROPERTIES IN TRANSITION METAL MONOXIDES Final Report, 1 Aug. 1983 - 31 May 1984
J. B. Cohen, D. E. Ellis, and T. O. Mason Jun. 1984 5 p refs
(Contract DE-AC02-83ER-45043)
(DE84-014851; DOE/ER-45043/1) Avail: NTIS HC A02/MF A01

Evidence for defect clusters at 900(0) C in single crystal wustite (Fe/sub 1-x/O) was found in high temperature diffuse X-ray scattering. An analysis procedure was developed to derive short range order parameters (and, hence, atomic displacements) from the scattering data. The clusters order along $< 100 >$ directions with an average spacing of 2.5a, reminiscent of the P'' phase detected in quenched specimens. A two-cluster model was developed to explain the electrical property variations in FeO. Local density studies were made on transition metal clusters, surface complexes, and oxide defect structures. Spectroscopic and structural properties have been predicted. In particular, X-ray K-edge photoabsorption cross sections were calculated for VO and TiO. Results are in reasonable agreement with experiment. DOE

N84-33243# Los Alamos Scientific Lab., N. Mex.
PERIOD-DOUBLING 2-TORUS STATE IN A CONVECTING He-3-SUPERFLUID He-4 SOLUTION
H. Haucke, Y. Maeno, and J. C. Wheatley 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15-22 Aug. 1984
(Contract W-7405-eng-36)
(DE84-009985; LA-UR-84-1052; CONF-840842-10) Avail: NTIS HC A02/MF A01

The nonlinear dynamical behavior of a convecting dilute solution of He-3 in superfluid He-4 which approaches a chaotic state via a period-doubling sequence of one of two incommensurate frequencies is discussed. Power spectra and Poincare sections are presented. Fair agreement with expected values for the power ratio of successive subharmonics was obtained. R.S.F.

N84-33244# Los Alamos Scientific Lab., N. Mex.
ONSET OF OSCILLATIONS IN SYMMETRIC CONVECTIVE STATES IN A SUPERFLUID He-3-He-4 MIXTURE
Y. Maeno, H. Haucke, R. Ecke, and J. C. Wheatley 1984 3 p refs Presented at the 17th Intern. Conf. on Low Temp. Phys., Karlsruhe, West Germany, 15-22 Aug. 1984
(Contract W-7405-eng-36)
(DE84-009984; LA-UR-84-1020; CONF-840842-5) Avail: NTIS HC A02/MF A01

The oscillatory convective instability in a solution of 1.46% He-3 is studied in the Prandtl number range of 0.04 less than or approximately equal sigma less than or approximately equal 0.15. The observed behavior supports the theory of oscillatory convection for a classical, low Prandtl number, one component fluid. A local temperature probe indicates a striking difference in the oscillatory amplitude when the sense of rotation of the convective rolls is reversed. DOE

N84-33245# Los Alamos Scientific Lab., N. Mex.
DYNAMICS OF NORMAL-ZONE PROPAGATION IN Ta AT SMALL CURRENTS
W. C. Overton, Jr. and H. Weinstock (Illinois Inst. of Tech.) 1984 3 p refs Presented at 17th Intern. Conf. on Low Temp. Phys.,

Karlsruhe, West Germany, 15 Aug. 1984
(Contract W-7405-eng-36)
(DE84-009990; LA-UR-84-1051; CONF-840842-9) Avail: NTIS HC A02/MF A01

In normal-zone propagation in thin wires embedded in liquid He, the velocity of the N-S interface is strongly influenced by heat conductance to the bath. The usual frontal N-S interface propagation at constant velocity was observed. However, for small currents near the critical value, healing of the N-zone back to the S-state occurs, thus forming a propagating S-N interface the velocity of which oscillates in time. The dynamics of this phenomenon are discussed. DOE

N84-33246# Brookhaven National Lab., Upton, N. Y.
NUCLEATION AND GROWTH OF N- AND P-TYPE MICROCRYSTALS IN LOW-TEMPERATURE GLOW-DISCHARGE DEPOSITED SILICON FILMS
P. E. Vanier, J. Tafto, G. Rajeswaran, and F. J. Kampas 1984 8 p refs Presented at Intern. Topical Conf. on Transport and Defects in Amorphous Semiconductors, Bloomfield Hills, Mich., 22 Mar. 1984
(Contract DE-AC02-76CH-00016)
(DE84-013122; BNL-34780; CONF-8403132-2) Avail: NTIS HC A02/MF A01

Doped microcrystalline silicon films were prepared by glow discharge of hydrogen containing small concentrations of silane and either diborane or phosphine with substrate temperatures in the range 135 to 250 C. The formation of crystals appears to be controlled by an initial nucleation step which is very sensitive to deposition conditions, including gas composition and substrate temperature T sub s. Once a nucleus is formed, subsequent growth and renucleation is not strongly dependent on T sub s. A possible mechanism for crystal growth at low temperature is presented. DOE

N84-33247# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
EFFECT OF SURFACE DOPING ON THE OXIDATION OF CHROMIA FORMER ALLOYS
M. Landkof, D. H. Boone, R. Gray, A. V Levy, and E. Yaniv Apr. 1984 62 p refs Presented at NACE Corrosion 1984 Intern. Forum and Exhibition, New Orleans, 1 Apr. 1984
(Contract DE-AC03-76SF-00098)
(DE84-013390; LBL-17237; CONF-840405-13) Avail: NTIS HC A04/MF A01

Y, Ce, La, Hf, Ca, and Zr were applied to the surfaces of type 304 and 310 stainless steels and In 738, a nickel base alloy. In order to determine the effect of the minor alloying elements in stainless steels on the surface doping effect, Y was applied to three alloy modifications of type 304SS. The presence or absence of Mn and Si in the alloy on the high temperature corrosion behavior was determined. Several different doping techniques were used to determine which technique was most beneficial to the behavior of the oxide barrier scale. The application of Y, Ce and La was found to enhance the oxidation resistance of the commercial stainless steels while no benefits were found for alloys doped with Hf, Ca and Zr. It was determined that Si had to be present in the type 304 SS for the doping process to enhance the oxidation resistance. There was no beneficial effect on modified 304SS containing Mn only or without Mn or Si. The yttrium doped and undoped modified type 304SS with Si only showed more resistance to scale spallation than any other type 304SS alloy tested, either commercial or modified. DOE

N84-33248# Boston Univ., Mass.
INFRARED ABSORPTION SPECTRUM OF FREE CARRIERS IN POLAR SEMICONDUCTORS Final Report, 1 Jul. 1983 - 30 Jun. 1984
B. Jensen and A. Torabi Jun. 1984 15 p refs
(Contract DE-AC02-79ER-10444)
(DE84-013276; DOE/ER-10444/10) Avail: NTIS HC A02/MF A01

A quantum mechanical expression for the real part of the refractive index of a III-V, II-VI, or IV-VI binary, ternary, or quaternary semiconductor was derived which predicts the dispersion observed near the fundamental absorption edge. The calculation is made in terms of measurable experimental quantities only, with no adjustable parameters, using the Kane theory of the band structure. Results were calculated for a wide variety of materials, and comparison made with available experimental data. An expression for the nonlinear intensity dependent refractive index is given. An extension of the Drude theory was made which predicts the quantum result for the complex dielectric constant at high frequencies and reduces to the usual quasiclassical result in the far infrared. The results of this research are expected to find application in implementation of optical processing systems in the infrared and in the design of integrated circuits, systems, and devices based on the III-V, II-VI or IV-VI compounds. DOE

N84-32600# Joint Publications Research Service, Arlington, Va.
HIGH-SPEED THYRISTORS ON WEAKLY DOPED GaAs Abstract Only
S. Gaybullayev, A. B. Gappoyev, V. G. Danilchenko, V. I. Korolkov, V. G. Nikitin, and A. V. Fozhkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 40 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 10, Oct. 1983 p 2052-2056 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32602# Joint Publications Research Service, Arlington, Va.
JOSEPHSON POINT CONTACTS NOISE PROPERTIES AT MICROWAVE Abstract Only
A. N. Vystavkin, V. N. Gubankov, V. P. Dyakov, and M. A. Tarasov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 42 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 28, no. 12, Dec. 1983 p 2457-2459 Original language document previously announced in IAA as A84-20170 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32605# Joint Publications Research Service, Arlington, Va.
INTERMODULATION DISTORTIONS IN SEMICONDUCTOR MICROWAVE RECEIVERS AND TRANSMITTERS (SURVEY) Abstract Only
Yu. L. Khotuntsev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 44-45 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 28-38 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32606# Joint Publications Research Service, Arlington, Va.
APPROXIMATION MODELS FOR ELECTRODYNAMIC SYSTEMS IN SOLID STATE MILLIMETRIC WAVE DEVICES Abstract Only
B. A. Kotserzhinskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 45 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 38-45 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32607# Joint Publications Research Service, Arlington, Va.
MILLIMETRIC WAVE FREQUENCY CONVERTER USING GUNN-EFFECT DIODE Abstract Only
A. F. Radchenko and I. V. Malyshev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 46 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 45-51 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32611# Joint Publications Research Service, Arlington, Va.
STABLE ASYNCHRONOUS TWO-FREQUENCY OSCILLATIONS IN GUNN-EFFECT DIODE WITH OPEN RESONATOR STRUCTURE Abstract Only

A. M. Fursov, B. M. Bulgakov, and A. I. Fisun *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 49 Transl. into ENGLISH from Izv. Vysah. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, No. 10, Oct. 1983 p 80-82 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-32612# Joint Publications Research Service, Arlington, Va.
INTERMODULATION IN PROTECTIVE SEMICONDUCTOR MICROWAVE DEVICES Abstract Only
A. I. Ropiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-006) 21 May 1984 p 50 Transl. into ENGLISH from Izv. Vysah. Ucheb. Zaved.: Radioelektron. (Kiev), v. 26, no. 10, Oct. 1983 p 92-94 (For primary document see N84-32580 22-31)
Avail: NTIS HC A04

N84-33338# Massachusetts Inst. of Tech., Cambridge.
SEMICONDUCTOR SURFACE STUDIES Abstract Only
John D. Joannopoulos, Dung-Hai T. Lee, Alfred D. Stone, Y. Bar-Yam, K. Rabe, and E. Kaxiras *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 5 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33345# Massachusetts Inst. of Tech., Cambridge.
OPTICAL SPECTROSCOPY OF DISORDERED MATERIALS AND X-RAY SCATTERING FROM SURFACES
James D. Litster, Satyendra Kumar, J. Brock, Brent D. Larson, J. Sameeth, Lorraine E. Solomon, and S. Sprunt *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 49-50 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33347# Massachusetts Inst. of Tech., Cambridge.
QUANTUM TRANSPORT IN LOW DIMENSIONAL DISORDERED SYSTEMS
Patrick L. Lee *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 53-54 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33351# Massachusetts Inst. of Tech., Cambridge.
ELECTRONIC PROPERTIES OF AMORPHOUS SILICON DIOXIDE
Marc A. Kastner, S. Oda, and J. H. Stathis *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 81-82 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

N84-33353# Massachusetts Inst. of Tech., Cambridge.
SUBMICRON STRUCTURES TECHNOLOGY AND RESEARCH
H. I. Smith, A. M. Hawryluk, C. M. Horwitz, J. Meingailis, C. V. Thompson, D. P. Chen, T. Yonehara, E. H. Anderson, H. A. Atwater, S. Y. Chou et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 85-93 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-33249 Harvard Univ., Cambridge, Mass.
INVARIANT FORMULATION OF AND RADIATIVE CORRECTIONS IN QUANTUM GRAVITY Ph.D. Thesis
Richard Paul Woodard 1984 622 p
Avail: Univ. Microfilms Order No. DA8410940

The Einstein theory of gravity is formulated around a new interpolating field--the Mandelstam covariant constructed solely from geodesics, parallel transport, and the Riemann tensor. It is shown that this interpolating field is nonlocal in all gauges and hence may not give the usual S matrix beyond tree order. Various arguments for preferring the new formalism over the old are advanced, chief among these is the possibility that Green's functions based on the new interpolating field may be finite. Using dimensional regularization and perturbing around flat space the simplest of the new Green's functions, the invariant two point function is calculated to one loop. The result is found to possess double poles for D = 4,6,8,..., and single poles for D = 5,7,9,... It is demonstrated, however, that perturbation around flat space is incorrect because the Mandelstam covariant is nonlocal and of exponential order in the metric. By introducing auxiliary fields the true stationary point of the functional integral is shown to be the field configuration of a point particle with four unit spins interfacing with gravity. Dissert. Abstr.

N84-33250# Naval Research Lab., Washington, D. C.
AN ENTROPY MAXIMUM PRINCIPLE AND RELAXATION PHENOMENA
A. K. Rajagopal, S. Teitler, and K. L. Ngai 20 Jul. 1984 19 p (AD-A143531; NRL-MR-5371) Avail: NTIS HC A02/MF A01 CSCL 12/1

A Shannon (epoch) entropy is defined in terms of an integral over the full temporal epoch of relaxation. A maximum entropy principle yields a linear exponential as a fundamental form for relaxation to equilibrium. It is observed that the time scale of measurements does not in general coincide with the time scale on which the fundamental form is described. Time scale transformations are considered. The maximum entropy density is taken to be form-invariant independent of the time scale used in its description, and the resulting epoch entropy is itself taken to be an invariant. This latter invariance leads to a relation between the time unit on a transformed time scale and the time unit on the fundamental scale. An appropriate choice for the form of a time scale of measurements for relaxation phenomena is rationalized. The results of the complete formalism are a fractional exponential for relaxation decay, and renormalization relations for scaling parameters and activation energies. These results have been consistently verified in a wide range of relaxation measurements for many kinds of condensed matter. Author (GRA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-33251# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
QUANTITATIVE TREATMENT OF FUZZY RELATIONS IN THE PROCESS OF ALLOCATING RESOURCES TO R AND D PROJECTS [TRATAMENTO QUANTITATIVO DE RELACOES IMPRECISAS NO PROCESSO DE ALOCACAO DE RECURSOS A PROJETOS DE P AND D]
Oscar Pereira Dias, Jr. May 1983 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 16th Brazilian Symp. on Operational Research, Florianopolis, Brazil, Oct. 1983
(INPE-2761-PRE/336) Avail: NTIS HC A02/MF A01

The relationship between project progress and allocated resources, in the resource allocation process to R & D projects, is supposed to be known in a linguistic (non-numeric) and fuzzy

format. In order to make a quantitative analysis of this relationship, a specific language was adapted. Departing from this particular language it becomes possible to infer about the progress of a project, or group of projects, when a given amount of resources is allocated. This quantitative analysis is made possible by the association of fuzzy subsets of a numeric universe of discourse to the meaning expressed by the language terms. Author

N84-33252# Air Command and Staff Coll., Maxwell AFB, Ala.
DETERMINATION OF FACTORS AFFECTING PERFORMANCE AND PRODUCTIVITY IN AN ENGINEERING/DESIGN ENVIRONMENT
R. J. Rosales, Jr. Mar. 1984 108 p
(AD-A143315; ACSC-84-2225) Avail: NTIS HC A06/MF A01 CSCL 05/1

Within all organizations there exist opportunities for constructive change, e.g., improving employee motivation, increasing management effectiveness, and enriching the quality of work life. This study attempts to generalize employee perceptions towards their organization and through inductive reasoning offer a basis for strategy selection to maximize the effects of the constructive change being sought. This study delves into the structure of a Real Property Maintenance Activity, its people and their perceptions of the work environment. It attempts a critical analysis not for the purpose of censure but rather to introduce one method that can precede constructive change in order to realize the full potential of the change. GRA

N84-33253# Air Command and Staff Coll., Maxwell AFB, Ala.
MATRIX MANAGEMENT IN DoD: AN ANNOTATED BIBLIOGRAPHY
D. A. Wiederhold Apr. 1984 40 p
(AD-A143316; ACSC-84-2780) Avail: NTIS HC A03/MF A01 CSCL 05/1

This report collectively examines the department of defense's (DOD) literature about matrix management from 1973 to spring 1984. This report also annotates 36 references and classifies them by: (1) author's opinion, experience; (2) literature review; (3) data/survey results; and (4) official guidance. The document discusses general impressions regarding each group and provides synthesis. B.W.

N84-33254# General Accounting Office, Washington, D. C. National Security and International Affairs Div.
ANALYSIS OF BENEFITS REALIZED FROM MULTIYEAR CONTRACTING FOR THE BLACK HAWK HELICOPTER
9 May 1984 17 p
(AD-A143485; GAO/NSIAD-84-74) Avail: NTIS HC A02/MF A01 CSCL 05/1

In 1982, the Congress authorized a $950 million 3-year multiyear contract for 294 Black Hawk helicopters. The Army estimated that such an arrangement would save about $8.1 million, or 7.9 percent, compared with three successive annual contracts for the same number of helicopters. GAO's analysis indicated an estimated budgetary savings to the Army of $73.9 million, with a net discounted savings to the government of about $46.6 million, or about 4.6 percent. GAO's estimate of net savings takes into account the cost of providing funds earlier under the multiyear contract. In addition, revenue to the U.S. Treasury may be reduced because of the tax implications of a multiyear contract. Neither the Army nor the contractor had evidence that the Black Hawk multiyear contract significantly enhanced the defense industrial base, another anticipated benefit of multiyear contracting. Author (GRA)

N84-33255# Computer Horizons, Inc., Cherry Hill, N. J.
TEN YEAR TRENDS IN US TECHNOLOGICAL DEPENDENCE ON FOREIGN TECHNOLOGY AS INDICATED BY REFERENCING FROM US PATENTS. APPENDIX Final Report
Paul R. McAllister, Mark Carpender, and Dominic Olivastro 1 Aug. 1983 64 p
(Grant NSF PRA-81-18601; CHI Proj. 8113-R)
(PB84-196997; NSF/PRA-83047-App) Avail: NTIS HC A04/MF A01 CSCL 05A

This appendix contains a complete listing of all data used in the report entitled Ten Year Trends in U.S. Technological Dependence on Foreign Technology as Indicated by Referencing U.S. Patents. All tables give data by year for each of 56 Standard Industrial Classes (SIC) and for the total of the 56 SIC. Tables showing the number of U.S. owned and invented patents, the percent of total citations to foreign owned U.S. patents, foreign citations per patent from all patents and the percent of citations for foreign invented U.S. patents from foreign assigned and invented multinational patents are given. Schematics present raw data from which indicators on multinations were derived. Author (GRA)

N84-33256# Computer Horizons, Inc., Cherry Hill, N. J.
TEN YEAR TRENDS IN US TECHNOLOGICAL DEPENDENCE ON FOREIGN TECHNOLOGY AS INDICATED BY REFERENCING FROM US PATENTS Final Report
Paul R. McAllister, Mark Carpender, and Dominic Olivastro 1 Aug. 1983 80 p refs
(Grant NSF PRA-81-18601; CHI Proj. 8113-R)
(PB84-197003; NSF/PRA-83046) Avail: NTIS HC A05/MF A01 CSCL 05A

Quantitative indicators for foreign technological presence in the United States are reported on the basis of data derived from the front pages of U.S. patents issued from 1971 to 1980. It is noted that the percent of foreign owned and invented patents in the U.S. patent system increased from 26 percent in 1971 to 38; percent in 1980. The areas with the greatest increases are those where there have been recent influxes of foreign products - for example, motorcycles, radios and televisions, and primary metals. The percent of citations given by foreign owned and invented patents in the U.S. to foreign origin patents in the U.S. system is two and one half times as large as those given by U.S. owned and invented patents to foreign origin patents. Approximately one fourth of all the U.S. patents from 1971 to 1980 are owned by multinational corporations. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-33257* National Aeronautics and Space Administration, Washington, D. C.
NASA PATENTS ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES (SUPPLEMENT 25)
Jul. 1984 452 p refs 2 Vol.
(NASA-SP-7039(25)-Sect-2; NAS 1.21:7039(25)-Sect-2) Avail: NTIS HC $20.00 CSCL 05B

A subject index is provided for over 4300 patents and patent applications for the period May 1969 through June 1984. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, U.S. patent numbers, and NASA accession numbers. M.G.

N84-33258 Florida State Univ., Tallahassee.
THE ROLE OF THE STATE LIBRARY AGENCY IN THE FUTURE: A DELPHI STUDY Ph.D. Thesis
Sue ONeal OMedina 1983 236 p
Avail: Univ. Microfilms Order No. DA8408948

The Delphi technique is used to codify the opinions of experts in the library field regarding the role of the State Library Agency in the year 2000. Six panels representing State Library Agency directors, public, academic, school and special librarians; and other specializations rated the possibility and desirability of thirty-five role statements. Respondents agreed that the current methods of local-state-federal funding would continue; awarding of federal funds directly to eligible libraries would be unlikely and undesirable;

state networks would be governed by a commission with representation from the State Library Agency; multitype cooperatives are desirable; state library agencies should reorient their image to include all types of libraries. Concern was expressed about the need for personnel skilled in new roles, especially networking and the application of new technology. The study concluded that State Library Agency policy seems responsive to the expectations of its constituents and that conflict inevitable as state library agencies change their roles in the library environment. Dissert. Abstr.

N84-33259 Pittsburgh Univ., Pa.
PREDICTIONS OF SATISFACTION WITH AUTOMATED LIBRARY CIRCULATION SYSTEMS Ph.D. Thesis
Larry Osborne 1983 171 p
Avail: Univ. Microfilms Order No. DA8411682

This research investigates other than objective operational parameters, which affect satisfaction with automated library circulation systems. Libraries which had implemented or ordered systems as of June 1981 formed the population questionnaires were sent to each of these 256 libraries asking that the chief executive office department head who supervised circulation, and a person who checks books out on a day to day basis respond. Responses were received from 467 individuals. Variables included the extent to which an idealized planning process developed as part of the research, was followed; the degree of disconfirmation of expectations reported by the respondents (i.e., the degree to which the system did not perform as expected), the reported satisfaction level with the system, and other descriptive and demographic variables. It was found that disconfirmation of expectations was the most important determinant of satisfaction among the variables studied, generally accounting for more than 25 percent of total variance in satisfaction. Dissert. Abstr.

N84-33260 Connecticut Univ., Storrs.
A STUDY OF THE EXTENT OF AUTOMATION IN SMALL COLLEGE LIBRARIES AND RELATIONSHIPS OF ATTITUDES OF LIBRARY DIRECTORS TOWARD IT Ph.D. Thesis
Larry Wayne Yother 1984 147 p
Avail: Univ. Microfilms Order No. DA8410827

Library automation in small college libraries is a relatively new application for computers. Little has been known about the extent of library automation already in place, the attitudes of library directions toward it, or the relationships of these attitudes to the extent of automation in libraries. This has been especially true for small academic libraries with fewer than 100,000 volumes. This study surveyed a random national sample of 175 such libraries to determine the extent of automation in place, the attitudes of library directors toward automation in general, and the relationships of these attitudes and selected variables to the extent of automation in small libraries. The data on extent of automation were subjected to analysis of variance and stepwise multiple regression, to determine the relationship between the degree of library automation and size of collection, institutional control, background of directors and staff members, and attitudes toward library automation held by library directors. A .05 level of significance was applied to all resulting values. Dissert. Abstr.

N84-33261 Michigan Univ., Ann Arbor.
THE ALLOCATION OF DATA AND PROGRAMS IN DISTRIBUTED DATA PROCESSING ENVIRONMENTS Ph.D. Thesis
Amjad Umar 1984 390 p
Avail: Univ. Microfilms Order No. DA8412269

A generalized model and algorithm for the allocation of programs and data to a set of interconnected computers is presented. This problem is of key importance in the design and operation of several computing systems, commonly termed distributed data processing environments, in which a user at one computer can access, in addition to the data at the local computer, the data and computing facilities of remotely located computers. Simply stated, this problem is concerned with the allocation of P programs and D data files to N computers which minimizes the cost of storing and accessing the data while still satisfying the access time and availability requirements of a diverse set of users. This problem is complicated by several management and technical factors which take into account the policies, capacities and interfaces of the environment. Dissert. Abstr.

N84-33262 New York Univ., New York.
CONCURRENCY CONTROL USING LOCKS IN DISTRIBUTED DATABASES Ph.D. Thesis
Ouri Wolfson 1984 77 p
Avail: Univ. Microfilms Order No. DA8411449

Locking as a concurrency control mechanism for distributed databases was examined. Distributed locking policies which are methods for locking entities in distributed databases are defined and it is how existing policies for a centralized database generalize to the distributed case. A new category of Distributed Locking Policies, D policies, into which these generalizations fall are also found. An algorithm which determines whether all transactions of a given policy are guaranteed to produce only correct interleavings is presented. The algorithm is efficient, even though testing an arbitrary set of transactions for safety is coNP complete. It is proven that optimal locking of transactions satisfy the conditions tested by the algorithm is NP hard even for a centralized data base. Dissert. Abstr.

N84-33263 Northwestern Univ., Evanston, Ill.
DEDUCTION IN NONHORN DATABASES Ph.D. Thesis
Adnan Hussein Yahya 1984 104 p
Avail: Univ. Microfilms Order No. DA8411195

The class of nonhorn databases is investigated and several aspects of the problem of using theorem proving techniques for such databases are considered. This includes exploring the treatment of negative information and extending the existing method, suggested by Minker, to accept nonunit negative clauses. The algorithms based on the existing methods for the treatment of negative information can be highly inefficient. An alternative approach is suggested and a simpler algorithm based on it is given. The problems associated with query answering in nonhorn databases are addressed in comparison to those for the Horn case. The query evaluation process can be computationally difficult in the general case. Conditions under which the process is simplified are discussed. The topic of nonhorn general laws is considered and some guidelines are suggested to divide such laws into derivation rules and integrity constraints. The effect of such a division on the query evaluation process is discussed.
Dissert. Abstr.

N84-33264 California Univ., Los Angeles.
UPDATING REPLICATED FILES IN REAL TIME DISTRIBUTED PROCESSING SYSTEMS Ph.D. Thesis
Joseph Hellerstein 1984 174 p
Avail: Univ. Microfilms Order No. DA8411872

Consistency control protocols either check for conflicting file accesses before (early checking) or after (late checking) transactions reference shared files. Early checking protocols delay completing a transaction's execution, or execution response time T (sub E), until messages are exchanged for conflict checking. Doing so causes inter-computer synchronization delays (ICSD). Late checking protocols avoid such delays for T (sub E). But existing protocols repeatedly restart a transaction until it executes without conflict, which: (1) cause long ICSD to finalize a transaction's update, and (2) saturate the computers and interconnection network. Two new protocols that have no ICSD for T (sub E) and avoid repeated transaction restarts are presented. The exclusive-writer protocol (EWP) is a late checking protocol with no transaction restarts, database rollbacks, or deadlock due to shared data access. The exclusive-writer protocol with locking option (EWL) uses EWP when there is no conflict and restarts a transaction under Primary Site Locking (PSL) if it loses a conflict.
Dissert. Abstr.

N84-33265 Michigan Univ., Ann Arbor.
A METHODOLOGY FOR THE DISTRIBUTION OF DATABASES Ph.D. Thesis

Mourad Oulid-Aissa 1984 241 p
Avail: Univ. Microfilms Order No. DA8412221

An approach to distribute data that feature semantic cross references in a computer network is processed. The unit of distribution is the functional dependency (FD). The problem of the distribution of CRDUs is modeled in the form of a manageable multicommodity mixed integer program, with quadratic cost and linear constraints. Computational techniques and numerical experience are discussed. The research draws some practical conclusions about the distribution of CRDUs in a computer network. The effect of the reducing and assembly rates over the simultaneous referencing of CRDUs and over data redundancy, is investigated. The effect of the updating rates over cross referencing and over data redundancy, is investigated. It is suggested that a look up of the user provided data can indicate whether standard data distribution techniques, instead of CRDU distribution techniques, can be used. Dissert. Abstr.

N84-33266*# National Aeronautics and Space Administration, Washington, D. C.
NASA ADMINISTRATIVE DATA BASE MANAGEMENT SYSTEMS, 1984
James D. Radosevich, ed. Sep. 1984 126 p refs Conf. held in Hampton, Va., 6-7 Jun. 1984
(NASA-CP-2323; NAS 1.55:2323) Avail: NTIS HC A07/MF A01 CSCL 05B

Strategies for converting to a data base management system (DBMS) and the implementation of the software packages necessary are discussed. Experiences with DBMS at various NASA centers are related including Langley's ADABAS/NATURAL and the NEMS subsystem of the NASA metrology informaton system. The value of the integrated workstation with a personal computer is explored. For individual titles, see N84-33267 through N84-33281.

N84-33267*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STRATEGIES FOR CONVERTING TO A DBMS ENVIRONMENT
Dave M. Durban *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 1-10 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The conversion to data base management systems processing techniques consists of three different strategies - one for each of the major stages in the development process. Each strategy was chosen for its approach in bringing about a smooth evolutionary type transition from one mode of operation to the next. The initial strategy of the indoctrination stage consisted of: (1) providing maximum access to current administrative data as soon as possible; (2) select and developing small prototype systems; (3) establishing a user information center as a central focal point for user training and assistance; and (4) developing a training program for programmers, management and ad hoc users in DBMS application and utilization. Security, the rate of the data dictionary, and data base tuning and capacity planning, and the development of a change of attitude in an automated office are issues meriting consideration. A.R.H.

N84-33268*# National Aeronautics and Space Administration, Washington, D. C.
EFFECTIVE ORGANIZATIONAL SOLUTIONS FOR IMPLEMENTATION OF DBMS SOFTWARE PACKAGES
Douglas Jones *In its* NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 11-20 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The space telescope management information system development effort is a guideline for discussing effective organizational solutions used in implementing DBMS software. Focus is on the importance of strategic planning. The value of constructing an information system architecture to conform to the organization's managerial needs, the need for a senior decision maker, dealing with shifting user requirements, and the establishment of a reliable working relationship with the DBMS vendor are examined. Requirements for a schedule to demonstrate progress against a defined timeline and the importance of continued monitoring for production software control, production data control, and software enhancements are also discussed. A.R.H.

N84-33269*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ADMINISTRATIVE AUTOMATION IN A SCIENTIFIC ENVIRONMENT
Joyce R. Jarrett *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 21-28 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

Although the scientific personnel at GSFC were advanced in the development and use of hardware and software for scientific applications, resistance to the use of automation or purchase of terminals, software and services, specifically for administrative functions was widespread. The approach used to address problems and constraints and plans for administrative automation within the Space and Earth Sciences Directorate are delineated. Accomplishments thus far include reduction of paperwork and manual efforts; improved communications through telemail and committees; additional support staff; increased awareness at all levels on ergonomic concerns and the need for training; better equipment; improved ADP skills through experience; management commitment; and an overall strategy for automating. A.R.H.

N84-33270*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
THE ADMINISTRATIVE WINDOW INTO THE INTEGRATED DBMS
Georgia H. Brock *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 29-50 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

A good office automation system manned by a team of facilitators seeking opportunities to serve end users could go a long way toward defining a DBMS that serves management. The problems of DBMS organization, alternative approaches to solving some of the major problems, problems that may have no solution, and how office automation fits into the development of the manager's management information system are discussed. A.R.H.

N84-33271*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A USER VIEW OF OFFICE AUTOMATION OR THE INTEGRATED WORKSTATION
E. R. Schmerling *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 51-54 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

Central data bases are useful only if they are kept up to date and easily accessible in an interactive (query) mode rather than in monthly reports that may be out of date and must be searched by hand. The concepts of automatic data capture, data base management and query languages require good communications and readily available work stations to be useful. The minimal necessary work station is a personal computer which can be an important office tool if connected into other office machines and properly integrated into an office system. It has a great deal of flexibility and can often be tailored to suit the tastes, work habits and requirements of the user. Unlike dumb terminals, there is less tendency to saturate a central computer, since its free standing capabilities are available after down loading a selection of data. The PC also permits the sharing of many other facilities, like larger computing power, sophisticated graphics programs, laser printers and communications. It can provide rapid access to common data bases able to provide more up to date information than printed reports. Portable computers can access the same familiar office facilities from anywhere in the world where a telephone connection can be made. A.R.H.

N84-33272*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY EXPERIENCE WITH ADABAS/NATURAL c52
Andrew Swanson *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 55-56 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The use of the data base management system ADABAS and the companion software NATURAL and COM-PLETE at the Langley Research Center is evaluated. A brief overview of data base management system technology is provided as well as system upgrading, user requirements, and use of the system for administrative support. M.A.C.

N84-33273*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRIP AND LOAD DATA
Richard H. Jones *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 57-58 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The method of taking batch data files and loading these files into the ADABAS data base management system (DBMS) is examined. This strip and load process allows the user to quickly become productive. Techniques for data fields and files definition are also included. M.A.C.

N84-33274*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NATURAL GRAPHICS
Richard H. Jones *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 59-60 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The hardware and software developments in computer graphics are discussed. Major topics include: system capabilities, hardware design, system compatibility, and software interface with the data base management system. M.A.C.

N84-33275*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ASYNCHRONOUS FILE TRANSFER TO IBM PC'S
Jerome Hoerger *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 61-64 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The Asynchronous File Transfer System is used for interactively selecting and transmitting text files from the Langley Research Center's Business Data Systems Division (BDSD) host processor to an IBM Personal Computer. The IBM asynchronous communications support package is used for handling the communications on the personal computer. An application program (NATURAL, COBOL, etc.) is used for selecting and formatting the records to be transmitted, and three subroutine modules residing on the BDSD host processor are used for interfacing the application program and the communications software. Each record transmitted to the Personal Computer must be in the standard ASCII format. This record format is directly accessible by BASIC and many of the personal computer software packages provide utility programs for converting them to the format required for the particular package in question. R.J.F.

N84-33276*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATUS TRACKING SYSTEM FOR REPORTS
Jeanne P. Huffman *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 65-76 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The program DGR03 Status of Langley Formal Reports was developed to aid the Research Information and Application Division (RIAD) in tracking the progress of NASA formal reports through the review cycle. This review cycle was established by Langley Management as a control for Langley's final product: its research reports. The cycle is divided into 5 main stages with substages in each. The cycle can be completed in 165 days. This program has been an aid to RIAD in eliminating manual calculation, providing visible data for everyone concerned with report processing, eliminating the need to telephone divisions when reports are delinquent. The program can also provide information on the number of reports in any stage of the system at any period. R.J.F.

N84-33277*# National Bureau of Standards, Washington, D.C. Inst. for computer Sciences and Technology.
THE NBS DATA MANAGEMENT TECHNOLOGY PROGRAM
Helen M. Wood *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 77-80 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The National Bureau of Standards (NBS) Data Management Technology Program is discussed. The NBS Data Management Technology Program addresses major problems encountered during the following stages of an application's lifetime: requirements analysis and data base design, system selection and implementation, operations management and conversion. Products developed include standard software specifications, guides to best practice, standard data elements and representations, and reports documenting the experiences of other organizations as they attempt to improve the management of their computing resources. Data base Laboratory facilities are maintained for the investigation and analysis of state of the art data base technology. These facilities support collaborative testing with researchers, vendors, users, and standards developers. R.J.F.

N84-33278*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DATA COMMUNICATION BETWEEN DATA TERMINAL EQUIPMENT AND THE JPL ADMINISTRATIVE DATA BASE MANAGEMENT SYSTEM
Robert W. Iverson *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 81-88 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

Approaches to enabling an installed base of mixed data terminal equipment to access a data base management system designed to work with a specific terminal are discussed. The approach taken by the Jet Propulsion Laboratory is described. Background information on the Jet Propulsion Laboratory (JPL), its organization and a description of the Administrative Data Base Management System is included. R.J.F.

N84-33279*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA METROLOGY INFORMATION SYSTEM: A NEMS SUBSYSTEM
Earl S. German, Jr., Frederick A. Kern, Rickey P. Yow (Planning Research Corp.), and Ellen Peterson (Planning Research Corp.) *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 89-112 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

the NASA Metrology Information Systems (NMIS) is being developed as a standardized tool in managing the NASA field Center's instrument calibration programs. This system, as defined by the NASA Metrology and Calibration Workshop, will function as a subsystem of the newly developed NASA Equipment Management System (NEMS). The Metrology Information System is designed to utilize and update applicable NEMS data fields for controlled property and to function as a stand alone system for noncontrolled property. The NMIS provides automatic instrument calibration recall control, instrument historical performance data storage and analysis, calibration and repair labor and parts cost data, and instrument user and location data. Nineteen standardized reports were developed to analyze calibration system operations. R.J.F.

N84-33280*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY'S VIEWS ON NEMS
Jeannette W. George *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 113-114 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The views of the Langley Research Center regarding the NASA Equipment Management System (EMS) are discussed. One of Langley's greatest concerns is with the reconciliation between NEMS and the General Ledger. Langley's accounting system tracks cost data to the penny level. NEMS deals in whole dollar amounts. Therefore, Langley has no way of reconciling the two. The only approach that is acceptable to Langley, unless requirements for reconciliation are changed, is for the NEMS files and the reports involved in the process be at the penny level. All other NEMS reports can remain whole dollars. Also to reconcile, Langley needs data to show the difference between the previous cost and the new cost for the month. On an input record, the adjustment amount is added to the cost and recorded as total amount. The adjusted cost is not captured. In order to establish a control between the prior months and the current month, a new field needs to be added to capture the adjusted cost (debits And credits). Langley has not reconciled the Equipment account with the General Ledger since February 1984. Problems with NEMS regular production runs cause concern. Production at Langley is run on the second and/or third shift. If a run(s) terminates and/or abends in a particular module, Langley must wait until the next day to resolve NEMS problems after consultation with Headquarters personnel. For a successful installation, Langley must have a good data base to convert to NEMS and users and the data processing staff must work together. R.J.F.

N84-33281*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LARC LOCAL AREA NETWORKS TO SUPPORT DISTRIBUTED COMPUTING
Ed P. Riddle *In* NASA, Washington NASA Admin. Data Base Management Systems, 1984 Sep. 1984 p 115-122 (For primary document see N84-33266 22-82)
Avail: NTIS HC A07/MF A01 CSCL 05B

The Langley Research Center's (LaRC) Local Area Network (LAN) effort is discussed. LaRC initiated the development of a LAN to support a growing distributed computing environment at the Center. The purpose of the network is to provide an improved capability (over inteactive and RJE terminal access) for sharing multivendor computer resources. Specifically, the network will provide a data highway for the transfer of files between mainframe computers, minicomputers, work stations, and personal computers. An important influence on the overall network design was the vital need of LaRC researchers to efficiently utilize the large CDC mainframe computers in the central scientific computing facility. Although there was a steady migration from a centralized to a distributed computing environment at LaRC in recent years, the work load on the central resources increased. Major emphasis in the network design was on communication with the central resources within the distributed environment. The network to be implemented will allow researchers to utilize the central resources, distributed minicomputers, work stations, and personal computers to obtain the proper level of computing power to efficiently perform their jobs. R.J.F.

N84-33282# National Commission on Libraries and Information Science, Washington, D. C.
[GOALS AND ACTIVITIES OF THE NATIONAL COMMISSION ON LIBRARIES AND INFORMATION SCIENCE] Annual Report, 1981 - 1982
28 Apr. 1983 87 p
(ISSN-0091-2972; AR-11) Avail: NTIS HC A05/MF A01

Activities of the Commission are reported in meeting major goals; (1) developing specifications for library legislation; (2) improving the dissemination of federal information; and (3) improving library and information services through resource sharing and applications of technology. Work with the Executive and Legislative branches of the Federal government, and with various associations is described as well as international efforts. A.R.H.

N84-33283# National Commission on Libraries and Information Science, Washington, D. C.
A DECADE OF ACCOMPLISHMENT Annual Report, 1980 - 1981
30 Apr. 1982 114 p
(ISSN-0091-2972; AR-10) Avail: NTIS HC A06/MF A01

Accomplishments of the National Commission of Libraries and Information Science during its first ten years are summarized. Major activities of FY-81 include completion of a landmark study to identify the proper roles of the public sector, particularly the Federal government, and the private sector in disseminating information; participation in implementing the Paperwork Reduction Act, and support of the Intermountain Community Learning/Information Center Project. A.R.H.

N84-33284# RAND Corp., Santa Monica, Calif.
INTERACTIVE INFORMATION ENVIRONMENTS: A PLAN FOR ENABLING INTERDISCIPLINARY RESEARCH
Lee R. Talbert, Tora K. Bikson, and Norman Z. Shapiro Apr. 1984 76 p refs
(RAND/N-2115) Avail: NTIS HC A05/MF A01

The implementation of information technology in organizational settings is examined. Research plans and problems are discussed along with the preliminary procedures and hypotheses. An organizational structure is also provided. M.A.C.

N84-33285*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONCEPTUAL DESIGN OF A MONITORING SYSTEM FOR THE CHARTERS OF FREEDOM
James A. Cutts 15 Mar. 1984 125 p refs Sponsored in part by the National Archives Records Services
(Contract NAS7-918)
(NASA-CR-173909; NAS 1.26:173909) Avail: NTIS HC A06/MF A01 CSCL 05B

A conceptual design of a monitoring system for the Charters of Freedom was developed for the National Archives and Records Service. The monitoring system would be installed at the National Archives and used to document the condition of the Charters as part of a regular inspection program. The results of an experimental measurements program that led to the definition of analysis system requirements are presented, a conceptual design of the monitoring system is described and the alternative approaches to implementing this design were discussed. The monitoring system is required to optically detect and measure deterioration in documents that are permanently encapsulated in glass cases. An electronic imaging system with the capability for precise photometric measurements of the contrast of the script on the documents can perform this task. Two general types of imaging systems are considered (line and area array), and their suitability for performing these required measurements are compared. A digital processing capability for analyzing the electronic imaging data is also required, and several optional levels of complexity for this digital analysis system are evaluated. Author

N84-33286# RAND Corp., Santa Monica, Calif.
SCIENTIFIC AND TECHNICAL INFORMATION TRANSFER: ISSUES AND OPTIONS
Tora K. Bikson, Barbara E. Quint, and Leland L. Johnson Mar. 1984 124 p refs
(Grant NSF PRA-84-00609)
(RAND/N-2131-NSF) Avail: NTIS HC A06/MF A01

This Note describes a study funded under Contract PRA-84-00689 with the Division of Policy Research and Analysis (PRA) of the National Science Foundation (NSF). The purpose of the project is to identify and assess ways to improve the transfer to potential users of knowledge generated by federally funded research in science and technology. To accomplish this purpose, the study

examines problems of information quality control and processes by which scientific and technical knowledge is or could be tailored and packaged for users. It draws heavily from the literature listed in the bibliography and from informal telephone conversations with federal officials, industrial users, information producers, and others. The study includes an overview and evaluation of current federal policies and practices, and an assessment of alternative policy options, especially as they may relate to the NSF. Appendixes suggest future directions for research in dissemination policy and present a history of the evolution of relevant federal policies and milestones. B.W.

N84-33287# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 38, NUMBER 7 Monthly Publication
Larry E. Shaffer, ed. Jul. 1984 74 p
(AD-A143238; AD-E750949; ESN-38-7) Avail: NTIS HC A04/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. Articles included in this report pertains to: Behavioral Sciences; Biological Sciences; Computer Sciences; Earth Science; Education; Engineering; Material Sciences; Ocean Sciences; Physics; Science Policy; Space Science; and Technology. GRA

N84-33288# Air Command and Staff Coll., Maxwell AFB, Ala.
IMPLEMENTING AUTOMATED INFORMATION SYSTEMS IN THE AIR FORCE
J. P. Totsch Apr. 1984 34 p
(AD-A143398; ACSC-84-2605) Avail: NTIS HC A03/MF A01 CSCL 09/2

The report purpose is to review and evaluate Air Force guidance on implementing information systems and to provide step-by-step procedures on how to implement such systems. It presents the step-by-step procedures one must follow to initiate, plan, organize, implement, and maintain an automated information system. The project also evaluates Air Force guidance on implementing these systems from a user's perspective and recommends actions to ease the burden on the system implementer. GRA

N84-33289# Office of Naval Research, London (England).
PHYSICS IN EUROPE: A DATA FILE OF SELECTED RESEARCH Technical Report
D. Mosher 18 Jun. 1984 190 p
(AD-A143428; ONRL-R-7-84) Avail: NTIS HC A09/MF A01 CSCL 05/2

This report describes a data file of 1200 entries on European research in physics and related areas. The tables provided allow one to access research projects by subject matter and location. Author (GRA)

N84-33290# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN EVALUATION OF TWO RELIABILITY AND MAINTAINABILITY INFORMATION SYSTEMS M.S. Thesis
L. K. Bock Jan. 1984 72 p
(AD-A143438; AFIT-LSSR-66-83) Avail: NTIS HC A04/MF A01 CSCL 09/2

Air Force managers require adequate and timely information in order to make effective decisions regarding reliability and maintainability (R&M) issues. Since 1980, at least two Air Force organizations have contracted for additional computer data base systems to improve their R&M data requirements. These data base systems provide real-time maintenance and operational data on certain weapons systems. This study analyzed the output characteristics of these new data base systems to determine if they did provide improved information and comparison with the standard Air Force maintenance and operational data reports. It was shown that the two new data base systems did provide more timely R&M data which resulted in information that allowed for effective and efficient managerial decision making. However, all the timely information available for managerial decisions will be hindered until data input errors are reduced. Author (GRA)

N84-33291# Defense Technical Information Center, Alexandria, Va.
SOURCE HIERARCHY LIST. VOLUME 1: A THROUGH H Annual Report, Jul. 1983 - Jun. 1984
J. Beitzell Jul. 1984 811 p Supersedes DTIC/TR-83/2-Vol-1 2 Vol.
(AD-A143500; DTIC/TR-84/6-Vol-1; DTIC/TR-83/2-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 05/2

This is the first of two volumes of an alphabetical listing of corporate authors as used for announcement of reports received in the Defense Technical Information Center (DTIC). Former names of organizations are included and displayed below the current source name used by DTIC. Cross references direct the user from sub-element organizations to the major source level entry where they are also displayed. Major and sub-hierarchies are preceded and ended by a row of asterisks. This list is used in conjunction with and is not a replacement for DTIC's Source Header List, Volume 1, AD-A115000, Volume 2, AD-A115001, and Supplement 2, AD-A143800. It displays only those source names from the Source Header List for which hierarchical linkages are pertinent. Author (GRA)

N84-33292# Defense Technical Information Center, Alexandria, Va.
SOURCE HIERARCHY LIST. VOLUME 2: I THROUGH Z Annual Report, Jul. 1983 - Jun. 1984
J. Beitzell Jul. 1984 830 p Supersedes DTIC/TR-83/2-Vol-2 2 Vol.
(AD-A143501; DTIC/TR-84/6-Vol-2; DTIC/TR-83/2-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 05/2

This is the second of two volumes of an alphabetical listing of corporate authors as used for announcement of reports received in the Defense Technical Information Center (DTIC). Former names of organizations are included and displayed below the current source name used by DTIC. Cross references direct the user from sub-element organizations to the major source level entry where they are also displayed. Major and sub-hierarchies are preceded and ended by a row of asterisks. This list is used in conjunction with and is not a replacement for DTIC's Source Header List, Volume 1, AD-A115000, Volume 2, AD-A115001, and Supplement 2, AD-A143800. It displays only those source names from the Source Header List for which hierarchical linkages are pertinent. Author (GRA)

N84-33293# Texas A&M Univ., College Station. Dept. of Management.
AN EXPLORATORY ANALYSIS OF THE RELATIONSHIP BETWEEN MEDIA RICHNESS AND MANAGERIAL INFORMATION PROCESSING
R. H. Lengel and R. L. Daft Jul. 1984 73 p
(Contract N00014-83-C-0025)
(AD-A143503; TR-DG-08-ONR) Avail: NTIS HC A04/MF A01 CSCL 17/2

A dilemma exists between technical information designers and students of managerial information behavior. A richness model is proposed that uses the concepts of media richness and communication learning requirements to integrate the two perspectives. The concepts and model were tested in a four-stage research program, and they were generally supported. Managers tended to prefer rich, oral media when learning requirements were high and less rich, written media when learning requirements were low. Author (GRA)

N84-33294# General Accounting Office, Washington, D. C.
ALASKA LAND CONVEYANCE PROGRAM: A SLOW, COMPLEX AND COSTLY PROCESS
12 Jun. 1984 79 p refs
(PB84-207265; GAO/RCED-84-14; B-206829) Avail: NTIS HC A05/MF A01 CSCL 05K

Information about how much land the Bureau of Land Management conveyed to the state of Alaska and Alaska Native corporations, with problems the Bureau is encountering in trying to convey land in a timely manner, the impact of the problems on the state

and Alaska Natives, and ways the conveyance program can be improved is given. GRA

N84-33295*# National Academy of Sciences - National Research Council, Washington, D. C. Joint Data Panel.
SOLAR-TERRESTRIAL DATA ACCESS DISTRIBUTION AND ARCHIVING Final Report
Feb. 1984 43 p refs Sponsored in part by NOAA and the US Air Force
(NASA-CR-173906; NAS 1.26:173906; PB84-195361) Avail: NTIS HC A03/MF A01 CSCL 05B

It is recommended that a central data catalog and data access network (CDC/DAN) for solar-terrestrial research be established, initially as a NASA pilot program. The system is envisioned to be flexible and to evolve as funds permit, starting from a catalog to an access network for high-resolution data. The report describes the various functional requirements for the CDC/DAN, but does not specify the hardware and software architectures as these are constantly evolving. The importance of a steering committee, working with the CDC/DAN organization, to provide scientific guidelines for the data catalog and for data storage, access, and distribution is also stressed. GRA

N84-33296# National Library of Medicine, Bethesda, Md. Technical Services Div.
NOTES FOR MEDICAL CATALOGERS, 1983
May 1984 35 p refs
(PB84-195874; NLM-TSD-84-01) Avail: NTIS HC A03/MF A01 CSCL 05B

The report contains articles and news announcements describing the cataloging policies, procedures and bibliographic databases of the Cataloging Section of the National Library of Medicine. GRA

N84-33297# National Bureau of Standards, Washington, D.C. Chemical Engineering Div.
LIQUFIED NATURAL GAS DENSITIES: SUMMARY OF RESEARCH PROGRAM AT THE NATIONAL BUREAU OF STANDARDS Final Report
W. M. Haynes, R. D. McCarty, and M. J. Hiza Oct. 1983 249 p refs
(PB84-202647; NBS/Mono-172) Avail: NTIS HC A11/MF A01; also available from SOD as SN003-003-02587-9 CSCL 21D

The results of a project concerning the densities of liquefied natural gas (LNG) and its components are summarized. This project as carried out under the sponsorship of a consortium of eighteen energy companies. The density data were used to optimize, test, and compare several mathematical models as to their suitability for the calculation of LNG densities for custody transfer. Models selected for optimization and testing included an extended corresponding states method, a hard sphere model, a cell model, and an empirical model due to Klosek and McKinley. The ultimate goal of this project was to produce one or more mathematical models that could be used to predict the density of any LNG mixture to within an uncertainty of 0.1 percent from an input of pressure, temperature, and composition. After revisions based on the new experimental data from this project, each of the models investigated here satisfy this goal for typical LNG compositions. GRA

N84-33298 Michigan Univ., Ann Arbor.
ADAPTIVE SUBJECT DESCRIPTION IN DOCUMENT RETRIEVAL Ph.D. Thesis
Michael David Gordon 1984 189 p
Avail: Univ. Microfilms Order No. DA8412148

The central problem in document retrieval is that the subject of a document may be described in many different ways and, similarly, different inquirers may express similar information needs by a variety of different queries. Document descriptions comprise only one part of a retrieval system. Communication feedback about the queries of inquirers searching for a given document can be incorporated by a retrieval system in order to redescribe that document so that its description matches better those queries. An adaptive algorithm, responsible for such redescription, achieves two aims: it increases the probability of a document's subject description matching a query to which the document is relevant, the algorithm decreases the probability of a document's subject description matching a query to which the document is not relevant. Simulation experiments demonstrate the success of adaptive subject redescription in achieving these aims. The method of obtaining simulated queries is described. The simulation technique may help provide a solution to the problem of predicting the performance of a large scale retrieval system based on its operation in a smaller scale experimental setting. Dissert. Abstr.

N84-33360# Massachusetts Inst. of Tech., Cambridge.
COGNITIVE INFORMATION PROCESSING
W. F. Schreiber, D. E. Troxel, C. W. Lynn, L. Picard, K. P. Wacks, Yao-Ming Chao, Malik Khan, Qiding Du, D. Corteselli, and J. Ward *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 169-172 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-33299*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EFFECTS OF EXPIRATION OF THE FEDERAL ENERGY TAX CREDIT ON THE NATIONAL PHOTOVOLTAICS PROGRAM
Jeffrey L. Smith May 1984 48 p refs
(Contracts NAS7-918; DE-AI01-76ET-20356; JPL Proj. 5220-23) (NASA-CR-173900; JPL-84-36; NAS 1.26:173900; DOE/ET-20356/15) Avail: NTIS HC A03/MF A01 CSCL 05C

Projected 1986 sales are significantly reduced as a direct result of system price increases following from expiration of the Federal energy tax credits. There would be greatly reduced emphasis on domestic electric utility applications. Indirect effects arising from unrealized economies of scale and reduced private investment in PV research and development (R&D) and in production facilities could have a very large cumulative adverse impact on the U.S. PV industry. The industry forecasts as much as fourfold reduction in 1990 sales if tax credits expire, compared with what sales would be with the credits. Because the National Photovoltaics Program is explicitly structured as a government partnership, large changes in the motivation or funding of either partner can affect Program success profoundly. Reduced industry participation implies that such industry tasks as industrialization and new product development would slow or halt. Those research areas receiving heavy R&D support from private PV manufacturers would be adversely affected. A.R.H.

N84-33300# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
NEW TECHNIQUES FOR ADJUSTING REFERENCE FACTORS
Christine J. Wilson 1984 9 p Presented at the Intern. Soc. of Parametric Analysts Conf., San Francisco, Calif. 13 May 1984
(Contract DE-AC07-76ID-01570)
(DE84-012649; EGG-M-08584; CONF-8405172-1) Avail: NTIS HC A02/MF A01

Availability of analogous historical data is important to developing realistic cost estimates with parametric methodologies. Often, however, historical data of the same character and functional capability are not available; they have not or cannot be collected. A serious problem exists, for traditional, historically-data-bound, parametric techniques. Either the technique cannot be used, or adjustments to algorithms and reference data are complicated and unreliable. The FAST (Freiman Analysis of Systems Technique) parametric models developed by Frank Freiman have the unique feature of being linearly adjustable. This feature greatly facilitates the synthesis of historical data for use as references in new situations. Linearity emulates designers' and managers' cost change perceptions. It is easy for an engineer to express change

from a known design to a new one in linear terms. In all of the FAST models, this linear adjustment can be applied to account for change in the following complexities: production, engineering, installation, integration, schedule, construction, site work, utilities, and mining. Author

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-33301# Committee on Science and Technology (U. S. House).
THE 1985 NASA AUTHORIZATION, VOLUME 2
Washington GPO 1984 1168 p Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 2d Sess., no. 84, 1, 2, 7, 8, 9, 22, 23, 28, 29 Feb. and 1 Mar. 1984
(GPO-34-202) Avail: Subcommittee on Space Science And Applications

Of the 7.5 billion in the President's budget for NASA, $2.4 billion is allocated for research and development; $160 billion for space flight, control, and data communication; $160 million for construction of facilities; and $1.3 million for research and program management. Space station concepts and capabilities are explored and efforts to improve the shuttle main engine and assure cost effectiveness of the operational space shuttle are examined. Planning for the upper atmosphere research satellite mission, the Mars geoscience/climatology orbiter, and the advanced communications technology satellite is highlighted. The space commercialization, stabilization of number of civil service employees working for NASA, and the agency-wide productivity improvement and quality enhancement program are also discussed. A.R.H.

N84-33302# Committee on Science and Technology (U. S. House).
OVERSIGHT ON THE FEDERAL AVIATION ADMINISTRATION FISCAL YEAR 1985 RESEARCH, ENGINEERING AND DEVELOPMENT BUDGET REQUEST
Washington GPO 1984 183 p Hearings before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 2d Sess., no 79, 26, 28, 29 Mar. 1984
(GPO-34-924) Avail: Subcommittee on Transportation, Aviation and Materials

An analysis of the Federal Aviation Administration (FAA) budget for fiscal year 1985 is presented. A review of the research and development, and engineering programs necessary for the modernization of the air traffic control system is included. The status of the Systems Engineering Integration (SEI) contract to oversee implementation of the National Airspace System Plan is discussed. M.A.C.

N84-33303# Committee on Science and Technology (U. S. House).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1985
Washington GPO 1984 10 p H.R. 5154 enacted into law by the 98th Congr., 16 Jul. 1984
(Pub-Law-98-361) Avail: US Capitol, House Document Room

The feasibility of the establishment of a National Commission on Space is examined. Goal of the commission include: (1) to define the long-range needs of the Nation that may be fulfilled through the peaceful uses of outer space; (2) to maintain the Nation's preeminence in space science, technology, and applications; (3) to promote the peaceful exploration and utilization of the space environment; and (4) to articulate goals and develop options for the future direction of the Nation's civilian space program. M.A.C.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-33304*# Foster-Miller Associates, Inc., Waltham, Mass.
STEAM BOTTOMING CYCLE FOR AN ADIABATIC DIESEL ENGINE Final Report
E. Poulin, R. Demier, I. Krepchin, and D. Walker Mar. 1984 129 p refs
(Contracts DEN3-300; DE-AI01-80CS-50194)
(NASA-CR-168255; DOE/NASA/0300-1; NAS 1.26:168255; FMI-NAS-8273) Avail: NTIS HC A07/MF A01 CSCL 13F

Steam bottoming cycles using adiabatic diesel engine exhaust heat which projected substantial performance and economic benefits for long haul trucks were studied. Steam cycle and system component variables, system cost, size and performance were analyzed. An 811 K/6.90 MPa state of the art reciprocating expander steam system with a monotube boiler and radiator core condenser was selected for preliminary design. The costs of the diesel with bottoming system (TC/B) and a NASA specified turbocompound adiabatic diesel with aftercooling with the same total output were compared, the annual fuel savings less the added maintenance cost was determined to cover the increase initial cost of the TC/B system in a payback period of 2.3 years. Steam bottoming system freeze protection strategies were developed, technological advances required for improved system reliability are considered and the cost and performance of advanced systes are evaluated. E.A.K.

N84-33305*# National Aeronautics and Space Administration, Washington, D. C.
SPINOFF, 1984
James J. Haggerty Jul. 1984 127 p refs
(NASA-TM-85596; NAS 1.15:85596) Avail: NTIS HC A07/MF A01; SOD HC CSCL 05A

A pictorial resume that underlines the challenging nature of NASA programs and their extraordinary demands for technological input, is presented. Also, NASA's current mainline programs, which require development of new technology, are given. A representative sampling of spinoff products and processes resulting from technology utilization, or secondary application, and the mechanisms NASA employs to stimulate technology utilization are provided. Contact sources for further information are presented. S.B.

N84-33306*# Massachusetts Inst. of Tech., Cambridge. Automotive Lab.
COMPUTER SIMULATION OF THE HEAVY-DUTY TURBOCOMPOUNDED DIESEL CYCLE FOR STUDIES OF ENGINE EFFICIENCY AND PERFORMANCE Interim Report
Dennis N. Assanis, Jack A. Ekchian, John B. Heywood, and Kriss K. Replogle May 1984 71 p refs
(Grant NAG3-394; Contract DE-AI01-80CS-50294)
(NASA-CR-174755; DOE/NASA/0394-1; NAS 1.26:174755) Avail: NTIS HC A04/MF A01 CSCL 13F

Reductions in heat loss at appropriate points in the diesel engine which result in substantially increased exhaust enthalpy were shown. The concepts for this increased enthalpy are the turbocharged, turbocompounded diesel engine cycle. A computer simulation of the heavy duty turbocharged turbo-compounded diesel engine system was undertaken. This allows the definition of the tradeoffs which are associated with the introduction of ceramic materials in various parts of the total engine system, and the study of system optimization. The basic assumptions and the mathematical relationships used in the simulation of the model engine are described. E.A.K.

N84-33307*# Mechanical Technology, Inc., Latham, N. Y.
AUTOMOTIVE STIRLING ENGINE DEVELOPMENT PROGRAM. RESD SUMMARY REPORT Final Report
May 1984 217 p
(Contracts DEN3-32; DE-AI01-77CS-51040)
(NASA-CR-174674; DOE/NASA/0032-23; NAS 1.26:174674; MTI-84ASE356DR3) Avail: NTIS HC A10/MF A01 CSCL 13F

The design of reference Stirling engine system as well as the engine auxiliaries and controls is described. Manufacturing costs in production quantity are also presented. Engine system performance predictions are discussed and vehicle integration is developed, along with projected fuel economy levels. A.R.H.

N84-33308# Regional Planning Council, Baltimore, Md.
SCENARIO PLANNING: ENERGY CONSIDERATIONS IN THE LONG RANGE URBAN TRANSPORTATION PLANNING PROCESS
May 1983 253 p refs
(Contract De-AI01-81CS-90103)
(DE84-013590; DOT-I-83-20) Avail: NTIS HC A12/MF A01

The incorporation of energy conservation in regional planning framework was studied. The scenario technique is a comprehensive approach which considers the interaction of energy issues with transportation and other planning concerns such as land use, technological change, and economic development. The project created several hypothetical futures typified by varying levels of oil availability, and constructed sets of policy responses designed to deal with the problems typifying those future conditions. Unique insights are gained which could not have emerged in the course of more conventional planning. DOE

N84-33309*# SKF Industries, Inc., King of Prussia, Pa.
SOLID LUBRICATION DESIGN METHODOLOGY
Bharat B. Aggarwal, Thomas M. Yonushonis, and Richard L. Bovenkerk May 1984 112 p refs
(Contracts DEN3-323; DE-AI01-80C-50194)
(NASA-CR-174690; DOE/NASA/0323-1; NAS 1.26:174690) Avail: NTIS HC A06/MF A01 CSCL 13I

A single element traction rig was used to measure the traction forces at the contact of a ball against a flat disc at room temperature under combined rolling and sliding. The load and speed conditions were selected to match those anticipated for bearing applications in adiabatic diesel engines. The test program showed that the magnitude of traction forces were almost the same for all the lubricants tested; a lubricant should, therefore, be selected on the basis of its ability to prevent wear of the contact surfaces. Traction vs. slide/roll ratio curves were similar to those for liquid lubricants but the traction forces were an order of magnitude higher. The test data was used to derive equations to predict traction force as a function of contact stress and rolling speed. Qualitative design guidelines for solid lubricated concentrated contacts are proposed. Author

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-33310*# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
OBSERVATIONS OF THE ULTRAVIOLET SPECTRA OF HELIUM (DB) WHITE DWARFS AND A STUDY OF THE ULTRAVIOLET SPECTRA OF WHITE DWARFS CONTAINING CARBON Final Technical Report, 1 Jan. - 31 Dec. 1983
Gary A. Wegner 17 Sep. 1984 13 p refs
(Grant NAG5-287)
(NASA-CR-173889; NAS 1.26:173889) Avail: NTIS HC A02/MF A01 CSCL 03A

Strong ultraviolet carbon lines were detected in the spectrum of the southern DC white dwarf BPM 11668. Observations of a number of hotter DB white dwarfs with IUE show no evidence of carbon features. Two additional DA white dwarfs were observed that have the strong unidentified absorption near 1400 A which now seems to be identified with another lower temperature feature as satellite lines to Lyman alpha radiation. Author

N84-33311# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
SOME MASSES FOR POPULATION 1 AND 2 CEPHEIDS
Russell B. Kidman and Arthur N. Cox 1984 5 p refs Presented at the IAU 82nd Colloq., Toronto, 28 May 1 Jun. 1984
(Contract W-7405-eng-36)
(DE84-014032; LA-UR-84-1981; CONF-8405180-2) Avail: NTIS HC A02/MF A01

The mases of Cepheids are described. If a Cepheid luminosity is known from membership in a galactic cluster, the mass/luminosity relation obtained from stellar evolution theory gives its mass. This evolution mass depends slightly on the composition, that is, the mass fraction of all the heavier elements, Z, but the composition dependence is small. DOE

N84-33349# Massachusetts Inst. of Tech., Cambridge.
RADIO ASTRONOMY
Alan H. Barrett, B. F. Burke, J. W. Dreher, Robert L. Kyhl, J. H. Lang, D. H. Staelin, D. H. Roberts, P. W. Rosenkranz, M. Shao, J. W. Barrett et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 65-73 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-33312 Syracuse Univ., N. Y.
SPHERICALLY SYMMETRIC RADIATION IN GRAVITATIONAL COLLAPSE Ph.D. Thesis
Donald Joseph Bridy 1983 137 p
Avail: Univ. Microfilms Order No. DA8410705

A previously neglected mode by which a star may lose energy in the late stages of gravitational collapse to the black hole state is investigated. A model consisting of a Schwarzschild exterior matched to a Friedman interior of collapsing pressureless dust is studied. The matter of the collapsing star is taken as the source of a massive vector boson field and a detailed value problem is carried out. Vector mesons are strongly coupled to all nucleons and will be radiated by ordinary matter during the collapse. The time dependent coupling between interior and exterior modes matched across the moving boundary of the collapsing star and the presence of the gravitational fields and their gradients in the field equations may give rise to a parametric amplification mechanism and permit the gravitational field to pump energy into the boson field, greatly enhancing the amount of boson radiation. Dissert. Abstr.

N84-33313 Wisconsin Univ., Madison.
ULTRAVIOLET INTERSTELLAR ABSORPTION TOWARD STARS IN THE SMALL MAGELLANIC CLOUD Ph.D. Thesis
Edward Luke Fitzpatrick 1984 206 p
Avail: Univ. Microfilms Order No. DA8405422

International Ultraviolet Explorer satellite spectra of nine stars located in the small magellanic cloud (SMC) are examined to study ultraviolet interstellar absorption along lines of sight to the SMC. The systematic properties of SMC interstellar absorption

are investigated. Studies of the SMC reveal that most of the neutral hydrogen resides in two complexes at velocities of 134 km sec and 167 km sec. The major absorption component in the ultraviolet data is generally found to be associated with the lower velocity H I mass. The stellar radial velocities, favor the higher velocity H I complex. The strongest lines of the low ionization species show absorption components near 100 km sec and 200 km sec. These are associated with H I concentrations at similar velocities, which were revealed in SMC H I surveys. The presence of 100 km sec and 200 km sec absorption in all of the SMC spectra indicates that both of these H I masses are less distant than the principal SMC H I components at 134 km sec and 167 km sec. The strongest C IV and Si IV lines seen at SMC velocities probably arise in the nebular environments of the stars. Dissert. Abstr.

N84-33314 Pittsburgh Univ., Pa.
PHOTOIONIZATION MODELS OF THE MgII AND CIV SELECTED CLOUDS OBSERVED IN ABSORPTION IN QSO SPECTRA Ph.D. Thesis
James Ross Schaeffer 1983 124 p
Avail: Univ. Microfilms Order No. DA8411773

Photoionization models are used to study the properties of the MgII and C IV selected clouds seen in absorption in QSO spectra. Self consistent solutions are found in the ionization equilibrium, and thermal equations. The MgII clouds are found to be ionized, and do not resemble the cold systems found in the disk of our galaxy. The MgII systems can not be optically thin, because not enough MgII is produced in thin clouds to be detectable. Because the clouds are optically thick, C II should be detectable in these systems. In the lower density models C IV is detectable. A test to determine the location of these clouds is proposed, and should allow determination of whether the clouds are in galactic halos of the IGM. The C IV clouds are studied, and limits on their ionization structure are placed by C II and NV. The C II limits the optical depth of these systems to be less than 1 (for solar abundances). By requiring that the clouds reside in galactic halos, a natural upper limit exists. It is found that the major difference between the C IV selected clouds and the MgII selected clouds is the Lyman-limit optical depth. The evolution of a C IV cloud into a MgII cloud is discussed. Dissert. Abstr.

N84-33315*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
RESEARCH RELATIVE TO HIGH ENERGY ASTROPHYSICS Final Report, 1 Feb. 1983 - 31 May 1984
Paul Gorenstein Aug. 1984 55 p
(Grant NAG5-294)
(NASA-CR-173878; NAS 1.26:173878) Avail: NTIS HC A04/MF A01 CSCL 03B

Various parameters which affect the design of the proposed large area modular array of reflectors (LAMAR) are considered, including thermal control, high resolution X-ray spectroscopy, pointing control, and mirror performance. The LAMAR instrument is to be a shuttle-launched X-ray observatory to carry out cosmic X-ray investigations. The capabilities of LAMAR are enumerated. Angular resolution performance of the mirror module prototype was measured to be 30 sec of ARC for 50% of the power. The LAMAR thermal pre-collimator design concepts and test configurations are discussed in detail. R.S.F.

N84-33316*# Texas Univ., Austin. Center for Space Research.
RELATIVE MOTION CHARACTERISTICS OF 2 NEAR-EARTH SATELLITES
Bob E. Schutz Sep. 1984 102 p refs
(Grant NAG5-346)
(NASA-CR-173887; NAS 1.26:173887) Avail: NTIS HC A06/MF A01 CSCL 03B

The stability of the nonlinear dynamical system of two GRAVSAT - type satellites was investigated by performing several numerical experiments which provide the simulations of the relative motion characteristics between the two satellites for various specified time intervals. The simulations included the relative range, range-rate, and relative acceleration magnitude. These simulations were generated with respect to appropriate initial orbital elements which were obtained such that the instantaneous separation distance between the two satellites has small fluctuations from a specified constant separation distance. The simulation results indicate that the behavior of the relative motions is very sensitive to the initial orbital elements of the satellites and that for a specified time interval of interest. A stable behavior is possible only with the use of an appropriate set of initial orbital elements compatible with the gravity field used to derive them. Author

N84-33317*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AXIONS, NEUTRINOS AND STRINGS: THE FORMATION OF STRUCTURE IN AN SO(10) UNIVERSE
F. W. Stecker Jul. 1984 10 p refs To be presented at the Fermilab Inner Space-Outer Space Workshop
(NASA-TM-86139; NAS 1.15:86139) Avail: NTIS HC A02/MF A01 CSCL 03B

In a class of grand unified theories containing SO(10), cosmologically significant axion and neutrino energy densities are obtainable naturally. To obtain large scale structure, both components of dark matter are considered to exist with comparable energy densities. To obtain large scale structure, inflationary and non-inflationary scenarios are considered, as well as scenarios with and without vacuum strings. It is shown that inflation may be compatible with recent observations of the mass density within galaxy clusters and superclusters, especially if strings are present. Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-33318 Harvard Univ., Cambridge, Mass.
THE NATURE AND ORIGIN OF REFRACTORY INCLUSIONS IN THE ALLENDE METEORITE Ph.D. Thesis
Alan Stanley Kornacki 1984 241 p
Avail: Univ. Microfilms Order No. DA8410919

A detailed, systematic petrographic study of all (a(189)a)Al-rich and olivine-rich inclusions larger than aproxmately 0.2 mm in diameter in 17 thin sections of the Allende CV3 chondrite was performed by optical and scanning electron microscopy; the mineral chemistry of representative examples of each type of inclusion was also determined by electron probe microanalysis. Most Allende inclusions are aggregates containing varying proportions of three distinct constituents, termed concentric objects, chaotic materials, and inclusion matrix. A new classification system for Allende inclusions is proposed. The two textual varieties of olivine-rich incusions (rimmed and unrimmed olivine aggregates) consist primarily of inclusion matrix, which differ from opaque meteorite matrix by being relatively depleted in sulfides, metal grains, and (perhaps) carbonaceous material. Dissert. Abstr.

N84-33319*# Itek Corp., Lexington, Mass. Optical Systems Div.
MORPHOLOGIC STUDIES OF THE MOON AND PLANETS Final Technical Report, 1 Jul. 1976 - 31 Aug. 1984
Farouk El-Baz and Ted A. Maxwell (National Air and Space Museum, Washington, D.C.) 19 Sep. 1984 18 p refs
(Contract NsG-7188)
(NASA-CR-173886; NAS 1.26:173886) Avail: NTIS HC A02/MF A01 CSCL 03B

The impact, volcanic, and tectonic history of the Moon and planets were investigated over an eight year period. Research on the following topics is discussed: lunar craters, lunar basins, lunar volcanoes, correlation of Apollo geochemical data, lunar geology, Mars desert landforms, and Mars impact basins. R.S.F.

N84-33320*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A GEOGRAPHIC COMPARISON OF SELECTED LARGE-SCALE PLANETARY SURFACE FEATURES
Stephen Paul Meszaros Aug. 1984 65 p refs
(NASA-TM-86147; NAS 1.15:86147) Avail: NTIS HC A04/MF A01 CSCL 03B

Photographic and cartographic comparisons of geographic features on Mercury, the Moon, Earth, Mars, Ganymede, Callisto, Mimas, and Tethys are presented. Planetary structures caused by impacts, volcanism, tectonics, and other natural forces are included. Each feature is discussed individually and then those of similar origin are compared at the same scale. R.S.F.

N84-33321*# Los Alamos Scientific Lab., N. Mex.
MODEL FOR GCR-PARTICLE FLUXES IN STONY METEORITES AND PRODUCTION RATES OF COSMOGENIC NUCLIDES
Robert C. Reedy 1984 27 p refs Presented at the 15th Lunar and Plantetary Sci. Conf., Houston, Tex., 12 Mar. 1984 Sponsored in part by NASA and by Max-Planck-Inst. fuer Chemie
(Contract W-7405-eng-36)
(NASA-CR-173923; NAS 1.26:173923; DE84-012435; LA-UR-84-1595; CONF-840385-3) Avail: NTIS HC A03/MF A01 CSCL 03B

A model is presented for the differential fluxes of galactic-cosmic-ray (GCR) particles with energies above 1 MeV inside any spherical stony meteorite as a function of the meteorite's radius and the sample's depth. This model is based on the Reedy-Arnold equations for the energy-dependent fluxes of GCR particles in the Moon and is an extension of flux parameters that were derived for several meteorites of various sizes. This flux is used to calculate the production rates of many cosmogenic nuclides as a function of radius and depth. The peak production rates for most nuclides made by the reactions of energetic GCR particles occur near the centers of meteorites with radii of 40 to 70 g/cm(2). Although the model has some limitations, it reproduces well the basic trends for the depth-dependent production of cosmogenic nuclides in stony meteorites of various radii. These production profiles agree fairly well with measurements of cosmogenic nuclides in meteorites. Some of these production profiles are different than those calculated by others. The chemical dependence of the production rates for several nuclides varies with size and depth. DOE

N84-33322*# Wheaton Coll., Norton, Mass. Dept. of Physics and Astronomy.
THE IONIZATION STRUCTURE OF PLANETARY NEBULAE V NGC 3242
Timothy Barker [1984] 27 p refs
(Grant NsG-5376)
(NASA-CR-173914; NAS 1.26:173914) Avail: NTIS HC A03/MF A01 CSCL 03B

Spectrophotometric observations of emission line intensities over the spectral range 1400 A to 9600 A were made in five positions in the planetary nebula NGC 3242. In two of the positions, both the weakness of the 1548 A, 1550 A C IV resonance lines and the steepness of the Balmer decrement suggest the possibility of internal dust in the nebula. The measured electron temperature varies little from the average value of 11,100 K, which is in reasonably good agreement with the less accurate value of 12,900 K measured from the Balmer continuum. The 4267 A C II line implies a C(2+) abundance that is much higher than that determined from the 1906 A, 1908 A C III lines. This discrepancy decreases with increasing distance from the central star. Equations used to correct for the existence of elements in other than the optically-observable ionization stages give results that are consistent and in agreement with abundances calculated using ultraviolet lines. This discrepancy decreases with increasing distance from the central star. Equations used to correct for the existence of elements in other than the optically-observable ionization stages give results that are consistent and in agreement with abundances calculated using ultraviolet lines. The logarithmic abundances are He=10.96, O=8.64, N=7.96, Ne=8.04, C=8.41, Ar=6.15, and S=6.51. R.S.F.

N84-33323*# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
TRAPPED PARTICLE ABSORPTION BY THE RING OF JUPITER Final Report, 15 Apr. 1981 - 15 Apr. 1983
Walker Fillius 15 Apr. 1983 36 p refs
(Contract NAGw-336)
(NASA-CR-173919; NAS 1.26:173919) Avail: NTIS HC A03/MF A01 CSCL 03B

The interaction of trapped radiation with the ring of Jupiter is investigated. Because it is an identical problem, the rings of Saturn and Uranus are also examined. Data from the Pioneer II encounter, deductions for some of the properties of the rings of Jupiter and Saturn. Over a dozen Jupiter magnetic field models are available in a program that integrates the adiabatic invariants to compute B and L. This program is to label our UCSD Pioneer II encounter data with the most satisfactory of these models. The expected effects of absorbing material on the trapped radiation are studied to obtain the loss rate as a function of ring properties. Analysis of the particle diffusion problem rounds out the theoretical end of the ring absorption problem. Other projects include identification of decay products for energetic particle albedo off the rings and moons of Saturn and a search for flux transfer events at the Jovian magnetopause. M.A.C.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-33324 California Univ., San Diego.
STUDIES OF THE MICROSCALE DENSITY FLUCTUATIONS IN THE SOLAR WIND USING INTERPLANETARY SCINTILLATIONS Ph.D. Thesis
Joseph Peter Filice 1984 157 p
Avail: Univ. Microfilms Order No. DA8412474

Interplanetary scintillation (IPS) observations are used to investigate the microscale density fluctuations in the solar wind. A technique for estimating the electron density power spectrum in the ecliptic from the IPS intensity spectrum is presented. The estimation algorithm is applied to data obtained when the solar wind was dominated by recurrent fast streams. It is found on the average that in the low speed regions of streams the spectrum has a power law exponent a is approximately equal to 3. The average spectrum is found to be a power law with a and is approximately equal to 3.5. It is not possible to extend estimates of the microturbulence spectrum to high lattitude sources. However an average level of the microscale fluctuations is estimated from measurements of scintillation variance. Observations of the dynamic spectrum of IPS are studied by considering numerically the diffraction of plane waves by a two dimensional random phase screen. Dissert. Abstr.

N84-33325*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPRESSIONS TO DETERMINE TEMPERATURES AND EMISSION MEASURES FOR SOLAR X-RAY EVENTS FROM GOES MEASUREMENTS
R. J. Thomas, R. Starr (Catholic Univ. of America), and C. J. Crannell Aug. 1984 14 p refs Submitted for publication
(NASA-TM-86142; NAS 1.15:86142) Avail: NTIS HC A02/MF A01 CSCL 03B

Expressions which give the effective color temperatures and corresponding emission measures for solar X-ray events observed with instruments onboard any of the GOES satellites are developed. Theoretical spectra were used to simulate the solar X-ray input at a variety of plasma temperatures. These spectra were folded through the wavelength dependent transfer functions for the two GOES detectors. The resulting detector responses and their ratio as a function of plasma temperature were then fit with simple analytic curves. Over the entire range between 5 and 30 million degrees, these fits reproduce the calculated color temperatures

within 2% and the calculated emission measures within 5%. With the theoretical spectra, similar expressions for any pair of broadband X-ray detectors whose sensitivities are limited to wavelengths between 0.2 and 100 A are calculable. Author

N84-33326*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE AND X-RAY OBSERVATIONS OF DELAYED BRIGHTENINGS AT SITES REMOTE FROM THE PRIMARY FLARE LOCATIONS
H. Nakajima, B. R. Dennis, P. Hoyng, G. Nelson, T. Kosugi, and K. Kai Aug. 1984 47 p refs Submitted for publication
(NASA-TM-86140; NAS 1.15:86140) Avail: NTIS HC A03/MF A01 CSCL 03B

Five examples of solar flares observed with the 17-GHz interferometer at Nobeyama in which a secondary microwave burst occurred at a distance of 100,000 km to 1,000,000 km from the primary flare site are presented. The secondary microwave burst in all five cases had a similar time profile to the primary burst with a delay of 2 to 25 s. The velocity of a triggering agent inferred from this delay and spatial separation is 10,000 km to 100,000 km/s. The intensity of the secondary burst was a factor of 3 to 25 smaller than that of the primary burst in all events except for one case in which it was a factor of 2 larger. The polarization degree of the secondary burst at 17 GHz was < 35%, significantly higher than the average value for typical impulsive bursts. Two of the events were accompanied by meterwave type III/V bursts located high in the corona between the primary and secondary sites. For two of the other events, X-ray images of he secondary source were obtained with the hard-X-ray imaging spectrometer on the Solar Maximum Mission. These observations strongly suggest that the distant microwave bursts were produced by electrons with energies of 10 keV to 100 keV which were channeled along a huge loop from the main flare site to the remote location. Author

N84-33327# California Univ., Berkeley. Lawrence Berkeley Lab. Chemical Biodynamics Div.
THE EFFECT OF DIMENSIONALITY ON SOLAR SPECTRUM CURVES
Thomas E. Casti and J. W. Otvos Apr. 1984 14 p
(Contract DE-AC03-76SF-00098)
(DE84-014136; LBL-17649) Avail: NTIS HC A02/MF A01

The shape of the solar irradiance curve and the location of its maximum are dependent upon the units chosen for expressing irradiance and therefore upon the experimental method of making the measurements. Relative bandwidth is used instead of the more conventional wavelength bandwidth or wavenumber bandwidth to increase precision. Formulae are given and curves are shown for expressing solar irradiance (6000 K black body) in all three ways and with respect to both power and photon rate. DOE

N84-33328# Arizona Univ., Tucson.
SOLAR VARIABILITY OBSERVED THROUGH CHANGES IN SOLAR FIGURE AND MEAN DIAMETER
1984 19 p refs
(Contract DE-AC02-80ER-10753)
(DE84-013914; DOE/ER-10753/4) Avail: NTIS HC A02/MF A01

A program to monitor solar luminosity variations through diameter measurements has been in operation at SCLERA since 1981. The solar diameter is measured at multiple angles from the equator. Measurements at these different angles have the advantage that not only can the solar oblateness be accurately measured, but also, a systematic errors introduced by atmospheric refraction can be reduced to minimum. An improved theoretical treatment relevant to the relationship between the sol diameter and luminosity for long period oscillations was successfully developed, and testing is currently underway. An absolute calibration system for the telescope field and should soon be operational. DOE

N84-33329# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA, NO. 475, MARCH 1984. PART 1: PROMPT REPORTS. DATA FOR SEPTEMBER 1983, MAY 1981
Mar. 1984 124 p 2 Vol.
(PB84-201508; SGD-475-Pt-1; NOAA-84060502-Pt-1;
LC-79-640375-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 03B

A detailed index of observations published in Solar-Geophysical Data is presented. In addition, the following parameters are considered: solar activity, solar flares, solar radio emisson, inferred interplanetary magnetic field polarity, mean solar magnetic field, geomagnetic substorms, sudden ionospheric disturbances, cosmic ray measurements, sunspots, and radio propagation. Data are given in tabular form, and solar maps are included. R.S.F.

N84-33330# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA, NO. 475, MARCH 1984. PART 2: COMPREHENSIVE REPORTS. DATA FOR SEPTEMBER 1983, MAY 1981 AND MISCELLANEA
Mar. 1984 128 p 2 Vol.
(PB84-201516; SGD-475-Pt-2; NOAA-84060503-Pt-2;
LC-79-640375-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 03B

A detailed index of observations published in Solar-Geophysical Data is presented. In addition, the following parameters are considered: Solar radio bursts, solar mass ejections, H-alpha solr flares, sunspots, and interplanetary solar particles. Data are given in tabular form, and synoptic solar maps are included. R.S.F.

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-33331 Maryland Univ., College Park.
A STUDY OF THE TEMPORAL AND SPECTRAL CHARACTERISTICS OF GAMMA RAY BURSTS Ph.D. Thesis
Jay Preston Norris 1983 279 p
Avail: Univ. Microfilms Order No. DA8412036

Gamma ray burst data obtained from the ISEE 3 gamma ray burst spectrometer and the solar maXimum mission's hard X-ray burst spectrometer were analyzed to yield information on burst temporal and spectral characteristics. A Monte Carlo approach was used to simulate the response to candidate spectral models. Energy loss spectra of those bursts determined to be within the detector field to view were deconvolved to produce incident photon spectra. The event selection criterion of the ISEE 3 experiment is based on the time to accumulate a preset number of photons rather than the photon count per unit time and a consequently independent of event duration for a given burst intensity. The burst sources may be neutron stars with typical rotation periods greater than tens of seconds. Since burst durations are comparable to or less than such time scales, detectable periodicity due to source rotation should be infrequent. If burst sources are within a few hundred parsecs, as implied by the uniform distribution of localizations in galactic latitude and longitude, the emitting region is probably optically thin. Dissert. Abstr.

N84-33332*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THREE PRECISE GAMMA-RAY BURST SOURCE LOCATIONS
T. L. Cline, U. D. Desai, B. J. Teegarden, C. Barat (Centre d'Etude Spatiale des Rayonnements), K. Hurley (Centre d'Etudes Spatiale des Rayonnements), M. Niel (Centre d'Etude Spatiale des Rayonnements), G. Vedrenne (Centre d'Etude Spatiale des Rayonnements), W. D. Evans (Los Alamos Scientific Lab.), R. W. Klebesadel (Los Alamos Scientific Lab.), J. G. Laros (Los Alamos Scientific Lab.) et al Jul. 1984 16 p refs Submitted for publication
(NASA-TM-86132; NAS 1.15:86132) Avail: NTIS HC A02/MF A01 CSCL 03B

The precise source regions of three moderately intense gamma

ray bursts are derived. These events were observed with the first interplanetary burst sensor network. The optimum locations of the detectors, widely separated throughout the inner solar system, allowed for high accuracy, over-determined source fields of size 0.7 to 7.0 arc-min(2). All three locations are at fairly high galactic latitude in regions of low source confusion; none can be identified with a steady source object. Archived photographs were searched for optical transients that are able to be associated with these source fields; one such association was made. Author

N84-33333*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE BROAD-BAND X-RAY SPECTRUM OF A QSO SAMPLE
D. M. Worrall and F. E. Marshall Jul. 1983 25 p refs Submitted for publication
(NASA-TM-85071; NAS 1.15:85071) Avail: NTIS HC A02/MF A01 CSCL 03B

A sample of 25 QSOs was used to investigate the average spectrum between the soft X-ray energy band of the Einstein Observatory image proportional counter, and the higher energy band of the HEAO 1 A2 experiment. The spectrum is similar to thoe exhibited by Seyfert galaxies and narrow emission line galaxies above 2 keV. The spectrum is soft enough that if these objects are typical of the higher redshift, more radio-quiet QSOs, then it is possible to exclude QSOs as being the dominant origin of the diffuse X-ray background. R.S.F.

N84-33334# Fermi National Accelerator Lab., Batavia, Ill.
POSSIBLE COSMOLOGICAL ORIGIN OF THE ULTRA HIGH ENERGY COSMIC RAYS
Christopher T. Hill Apr. 1984 6 p refs Presented at the 4th Moriond Astrophys. Meeting, La Plagne, France, 15 Jan. 1984
(Contract DE-AC02-76CH-03000)
(DE84-013083; FERMILAB-CONF-84/40-T; CONF-840150-6) Avail: NTIS HC A02/MF A01

Using improved spectrum evolution results for nucleons propagation through the 3(0)K microwave background, a model of the UHE cosmic rays above 10 (18) eV presented, assuming a universal cosmological component associated with bright phase activity and a semilocal component assocxiated with the Virgo cluster. The results for the spectrum and anisotropy are in good agreement with the Haverah Park EAS observations. An unambiguous and potentially detectable electron neutrino spectrum is derived. DOE

N84-33335# Seattle Univ., Wash. Dept. of Physics.
IDENTIFICATION OF GAMMA-RAY LINES OBSERVED FROM SS433
Eric B. Norman and David Bodansky (Washington Univ., Seattle) 1983 4 p refs
(Contract DE-AC06-81ER-40048)
(DE84-013829; DOE/ER-40048/82-L3) Avail: NTIS HC A02/MF A01

Preliminary evidence for gamma ray line emission from the region of SS433 was reported previously. Observed gamma ray line features at 1.2 and 1.5 MeV are possibly the red- and blue-shifted components of the 1.369-MeV line from the first excited state to ground state transition in (24)Mg. Some difficulties with this interpretation of the observed gamma ray lines are presented. DOE

99 GENERAL

N84-33336# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
RLE PROGRESS REPORT NO. 126 Report, 1 Jan. - 31 Dec. 1983
J. Allen and R. J. Birgeneau Jan. 1984 270 p refs
(RLE-PR-126) Avail: NTIS HC A12/MF A01

Topics discussed include: molecular microscopy; semiconductor surfaces; atomic resonance and scattering; chemical reaction dynamics; X-ray diffuse scattering; optics and quantum electronics; photonics; quantum magnetics; radio astronomy; remote sensing; plasma dynamics; communication networks; digital signal processing; speech communication; custom integrated circuits; and physiology. For individual titles, see N84-33337 through N84-33363.

N84-33337# Massachusetts Inst. of Tech., Cambridge.
MOLECULE MICROSCOPY c72
Joseph G. King, A. P. French, A. Essig, Joseph A. Jarrell, and S. J. Rosenthal *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 1-4 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Thermal and electron stimulated desorption of water and other molecules from biological materials were studied to understand the contrast mechanism in molecule microscopy; to measure the total water content of various samples; to measure the binding energy of this water; and to determine the order of the kinetics of the desorption process. The importance of these experiments comes from the central role of water in biological processes at the molecular level. B.G.

N84-33338# Massachusetts Inst. of Tech., Cambridge.
SEMICONDUCTOR SURFACE STUDIES Abstract Only c76
John D. Joannopoulos, Dung-Hai T. Lee, Alfred D. Stone, Y. Bar-Yam, K. Rabe, and E. Kaxiras *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 5 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

The properties of surfaces of solids and the interactions of atoms and molecules with surfaces is important. The recent advent of ultrahigh vacuum technology made microscopic studies of well-characterized surface systems possible. One of the most difficult problems in surface studies, both from the experimental and theoretical points of view, is simply the determination of the precise positions of the atoms on a surface. The total ground-state energy of a surface system from first principles was calculated to provide accurate theoretical predictions of surface geometries. Recent results of metal atoms deposited on a semiconductor surface look promising. The first total energy map for an interacting atom-surface system was obtained. The results of microscopic total energy calculations are combined with the renormalization group techniques to study structural phase transitions at finite temperatures. This provides an ab-initio framework for studying phase transitions and critical phenomena in solid systems. B.G.

N84-33339# Massachusetts Inst. of Tech., Cambridge.
ATOMIC RESONANCE AND SCATTERING c72
Daniel Kleppner, D. E. Pritchard, R. Ahmad-Bitar, T. Ducas, D. Kelleher, M. Ligare, A. M. Lyyra, P. Moskowitz, K. L. Saenger, N. Smith et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 7-8 ref (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Experiments were conducted in the following areas: mapping of energy levels of a Rydberg lithium atom in a strong magnetic field in the vicinity of a crossing between levels from different principle quantum numbers; electrodynaics in a cavity; resonance enhanced multiphoton ionization; velocity dependence of rotational rainbow structure in Na2-Ar; high precision mass measurement on single ions using cyclotron resonance; low temperature energy transfer; trapping of neutral atoms; and vibrationally inelastic collisions. B.G.

N84-33340# Massachusetts Inst. of Tech., Cambridge.
CHEMICAL REACTION DYNAMICS AT SURFACES c25
Sylvia T. Ceyer, John D. Beckerle, D. Gladstone, Myung B. Lee, M. McGonigal, R. J. Simonson, Sau Lan Tang, and Melissa Hines *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 19-21 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Construction, assembly and testing of molecular beam-EELS apparatus enable the dynamics of molecular-surface interactions to be studied - in particular, why dissociative chemisorption does

not occur on transition metal surfaces where the adsorption is known to be exoergic. The reaction dynamics of atomic oxygen and atomic halogens with semiconductor surfaces carried out with molecular beam-surface scattering techniques enables measurement of mass distribution, residence time distribution, angular distribution, and energy distribution of the product molecules. Also conducted was a spectroscopic study of the absorption of small molecules on single crystal rare earth metal and metal oxide surfaces. B.G.

N84-33341# Massachusetts Inst. of Tech., Cambridge.
X-RAY DIFFUSE SCATTERING c72
Robert J. Birgeneau, A. R. Kortan, M. Sutton, K. Evans-Lutterodt, J. Hong, L. J. Martinez-Miranda, S. G. J. Mochrie, B. M. Ocko, and E. Specht *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 23-26 refs (For primary document see N84-33336 22-99)
(Contract DAAG29-83-K-0003)
Avail: NTIS HC A12/MF A01

Modern X-ray scattering techniques are used to study the structures and phase transitions in novel states of condensed matter. Synchrotron radiation is used to study structure and transitions occurring at single surfaces. Current experiments are concentrated in three areas: the growth, structure, and phase transitions of intercalant materials, most especialiyy bromine-intercalated graphite; the structure and phase transitions of smectic liquid crystals, and the evolution from thin film to bulk structures of model systems. R.J.F.

N84-33342# Massachusetts Inst. of Tech., Cambridge.
PHASE TRANSITIONS IN CHEMISORBED SYSTEMS c25
A. Nihat Berker, D. Blankschtein, J. O. Indekeu, M. Kardar, M. Kaufman, D. Andelman, Robert G. Caflisch, S. R. McKay, R. E. Goldstein, and R. J. Lenk *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 27-30 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Microscopic theories are developed for condensed matter systems undergoing phase transitions. Phase diagrams and other macroscopic properties are deduced using renormalization-group techniques and other rigorous or approximate methods of statistical mechanics. Author

N84-33343# Massachusetts Inst. of Tech., Cambridge.
OPTICS AND QUANTUM ELECTRONICS c74
C. G. Fonstad, Hermann A. Haus, E. P. Ippen, S. Kawakami, Y. Yamamoto, H. Stram, E. Wintner, N. Dagli, J. Fujimoto, C. Gabriel et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 31-40 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

The development of prototype optical waveguide devices that operate at rates of many tens of Gigabertz is discussed. A 20 GHz Mach-Zehnder waveguide interferometric sampler was built and tested. Devices for high-rate optical communications, all optical logic gates, and the theory of the soliton laser are also discussed. R.J.F.

N84-33344# Massachusetts Inst. of Tech., Cambridge.
QUANTUM OPTICS AND PHOTONICS c74
S. Ezekiel, B. R. Mollow, John Kierstead, J.-M. Chanty, D. DiFillipo, P. R. Hemmer, S. H. Jain, R. E. Meyer, B. W. Peuse, D. R. Ponikvar et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 41-47 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Measurement of Fresnel-drag in moving media using a ring resonator techniques, observation of lineshape distortion by Raman induced focusing, the performance of a microwave clock based on a laser induced simulated Raman interaction, and a fiber ring resonator gyroscope are discussed. R.J.F.

N84-33345# Massachusetts Inst. of Tech., Cambridge.
OPTICAL SPECTROSCOPY OF DISORDERED MATERIALS AND X-RAY SCATTERING FROM SURFACES c76
James D. Litster, Satyendra Kumar, J. Brock, Brent D. Larson, J. Samseth, Lorraine E. Solomon, and S. Sprunt *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 49-50 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

The structure of ordered phases of surfactants is discussed. Three experimental techniques were used. To study orientational long range ordering, quasielastic light scattering was used, while time-resolved spectroscopy gave information on orientational short range order and dynamics. Finally, X-ray scattering was used to study positional order of the molecules. R.J.F.

N84-33346# Massachusetts Inst. of Tech., Cambridge.
INFRARED NONLINEAR OPTICS c74
Peter A. Wolff, Roshan L. Aggarwal, Piotr Becla, Chiravuri Jagannath, L. R. Ram-Mohan, Y. C. Sunny Yuen, Gregory Boebinger, S. Warnock, S. Wong, and Eric P. Youngale *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 51-52 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Four wave mixing spectroscopy has been used to study the stress dependence of the ground state multiplet of phosphorus donors in silicon at 1.8 K, using a quantitative stress cryostat. For compressive force, F, along [100] or [110] the 1s(E) level slits into two singlet levels. These measurements determine the stress deformation potential constants, characterizing the 1s - ground state multiplet. A direct measurement of the effect of uniaxial stress on the size of the envelope function should be possible via diamagnetic techniques. Saturation behavior of the band-gap resonant optical nonlinearity of 10.6 nu in HgCdTe was studied by degenerate four-wave mixing experiments over a wide range of laser intensities. The reflectivity saturates when the laser power density reaches 100 W/sq cm, and the third-order nonlinear susceptibility drops as the inverse of the laser intensity, thereafter. A theory of interband absorption at the pump frequency, due to state blocking, is in good agreement with the experiments. Four wave mixing experiments were used to study the variation of the third order nonlinear susceptibility, (3) with difference frequency delta omega and laser intensity I in low carrier concentration HgCdTe crystals. Three wave mixing, to generate far infrared radiation in the 100 mu range, has been investigated in uniaxially-strained n-InSb. Measurements of the difference frequency dependence of X(3) have been used to determine the light to heavy hole scattering rate in p-type GaAs. B.W.

N84-33347# Massachusetts Inst. of Tech., Cambridge.
QUANTUM TRANSPORT IN LOW DIMENSIONAL DISORDERED SYSTEMS c76
Patrick L. Lee *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 53-54 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

In the past year, important progress was made in understanding the anomalous quantized Hall effect. It was discovered experimentally that when a two dimensional electron gas (realized in GaAs-GaAlAs heterojunctions) is subject to a large magnetic field so that the lowest Landau level is partially occupied, steps appear in the Hall conductance. The phenomenon is referred to as the anomalous quantized Hall effect (where R are integers) which can be understood based on noninteracting electrons, a theory of the anomalous Hall effect must take full account of the interaction between electrons. In collaboration with D. Yoshioka (University of Tokyo) and B. Halperin (Harvard), numerical calculations of the eigenstates of a few (4 to 6) particles subject to periodic boundry conditions were performed. The ground state is found to exhibit downward cusps at upsilon = 1/3 and upsilon = 2/5 where upslon is the fractional filling of the Landau level. By studying the density-density correlation function, we found that the ground state is not a Wigner solid, but instead is best described as a liquid. It is speculated that the liquid state at upsilon 1/3 is separated by an energy gap from a variety of excited states. By going to a moving frame, it is clear that at upsilon = 1/3, a Hall current will flow without dissipation, even in the presence of impurities. The state of upsilon close to 1/3 can be considered as eh upsilon = 1/3 state plus a small density of quasi-particles. Resonance

tunneling in narrow mosfet's was also the subject of experimental work. B.W.

N84-33348# Massachusetts Inst. of Tech., Cambridge.
MICROWAVE AND QUANTUM MAGNETICS c32
Fredric R. Morgenthaler, Robert L. Kyhl, T. Bhattacharjee, and Dale A. Zeskind *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 55-63 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

The objective is to develop an understanding of electromagnetic, magnetostatic, and magnetoelastic wave phenomena and to employ them to create novel device concepts useful for microwave signal-processing applications. The development of novel device concepts for the millimeter wavelength portion of the electromagnetic spectrum is also under investigation. Experimental results are indicated. B.W.

N84-33349# Massachusetts Inst. of Tech., Cambridge.
RADIO ASTRONOMY c89
Alan H. Barrett, B. F. Burke, J. W. Dreher, Robert L. Kyhl, J. H. Lang, D. H. Staelin, D. H. Roberts, P. W. Rosenkranz, M. Shao, J. W. Barrett et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 65-73 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

In radio astronomy programs of research on the interstellar medium and and star formation were pursued. Achievements are also summarized for studies of: (1) The distribution of matter in galaxies and clusters of galaxies (2) software to analyze Jovian decametric data; (3) the two-color technique for obtaining relative astrometric positions with an interferometer; (4) continued improvement in the utilization of microwave data produced by NOAA satellites; (5) improved techniques for retrieval of atmospheric parameters from rassile microwave measurements o the Earth; (6) methods for obtaining high-spatial-resolution passive microwave sounding data; (7) meteorological measurement with the SMMR; (8) video-bandwith compression techniques and; (9) the use of resolution-preserving interpolation techniques to reconstruct missing frames in a frame sequence. B.W.

N84-33350# Massachusetts Inst. of Tech., Cambridge.
ELECTROMAGNETIC WAVE THEORY AND REMOTE SENSING c32
Jin Au Kong, W. C. Chew, S.-L. Chuang, Tarek M. Habashy, L. Tsang, M. A. Zuniga, Q. Gu, H.-Z. Wang, X. Xu, H. Chuang et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 75-79 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Research is carried out in the areas of electromagnetic wave theory and remote ensing. Achievements are summarized for studies of: (1) electromagnetic wave applications to microstrip antennas; (2) remote sensing with models of random media and discrete scatterers; (3) acoustic wave propagation; (4) remote sensing of vegetation and soil moisture; (5) passive microwave snow pack experiments; (6) active and passive remote sensing of the Earth terrain and; (7) active and passive remote sensing of ice. B.W.

N84-33351# Massachusetts Inst. of Tech., Cambridge.
ELECTRONIC PROPERTIES OF AMORPHOUS SILICON DIOXIDE c76
Marc A. Kastner, S. Oda, and J. H. Stathis *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 81-82 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

A number of significant changes and advancements have taken place in the investigation of defects in amorphous SiO2(a-SiO2). It has been found that the charge state of some of or all of the intrinsic defects in a-SiO2 is charged, in a metastable way, by exposure to sub-bandgap ultraviolet light. This change is manifested in several ways: (1) a mid-gap absorption band (4.8 eV); (2) a large enhancement of the intensity of the 1.9 eV photolumniescence band; and (3) the appearance of an electron-spin-resonance (ESR) signal. The discovery of photoinduced ESR in a-SiO2 is perhaps the most significant development. ESR provides a local probe of the structure of the defects which is complementary to the optical probes (absorption, luminescence). Experiments now in progress will enable us to correlate the photoinduced ESR and photoinduced optical effects, giving us specific information about the structure and properties of the defects instrinsic to SiO2. Although similar studies have relied on ionizing radiation (gamma or X-ray) to generate significant number of paramagnetic centers from the normally diagmagnetic ground state of the intrinsic defects. Photoinduced ESR has the advantage of providing another parameter, namely the photon energy. B.W.

N84-33352# Massachusetts Inst. of Tech., Cambridge.
PHOTON CORRELATION SPECTROSCOPY AND APPLICATIONS c72
Sow-Hsin Chen, M. Kotlarchyk, Y. S. Chao, C. L. Lin, C. Mizumoto, and E. Sheu *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 83-84 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

A high resolution spectroscopic technique based on scattered light intensity fluctuation measurement was in use for some time. A variation of the digital time-domain pulse correlation technique using a 256-channel clipped correlator was developed. The correlator-multichannel memory system is controlled by a PDP 11/MINC computer system which is capable of high speed data acquisition and analysis necessary for the study of time-varying phenomena. Theoretical methods were developed to analyze quasi-elastic, light-scattering spectra from cells undergoing Brownian motions of self-propelled motions in liquid media. The methods were tested successfully with a model bacterium Escherichia coli, and the applicability of the model calculation to cells of dimensions of the order of a micron was ascertained. Author

N84-33353# Massachusetts Inst. of Tech., Cambridge.
SUBMICRON STRUCTURES TECHNOLOGY AND RESEARCH c76
H. I. Smith, A. M. Hawryluk, C. M. Horwitz, J. Meingailis, C. V. Thompson, D. P. Chen, T. Yonehara, E. H. Anderson, H. A. Atwater, S. Y. Chou et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 85-93 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

The following research projects are described briefly: microfabrication, electronic conduction in ultra-narrow silicon inversion layers, MOS structures, field effect transistors, graphoepitaxy, zone melting recrystallization, transmission gratings, and diffraction gratings. R.S.F.

N84-33354# Massachusetts Inst. of Tech., Cambridge.
PLASMA DYNAMICS c75
George Bekefi, A. Bers, B. Coppi, T. H. Dupree, L. M. Lidsky, J. E. McCune, M. Porkolab, L. D. Smullin, R. H. Berman, G. Bertin et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 95-117 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

The following research projects are described: (1) relativistic electron beams and the generation of coherent electromagnetic radiation; (2) rippled field magnetrons; (3) free electron lasers; (4) Tokamak devices, radio frequency heating, and current drive; (and (5) thermonuclear plasma physics. R.S.F.

N84-33355# Massachusetts Inst. of Tech., Cambridge.
OPTICAL PROPAGATION AND COMMUNICATION c32
Jeffrey H. Shapiro, R. H. Rediker, P. Kumar, P. L. Bogler, R. S. Bondurant, F. Hakimi, M. W. Maeda, M. B. Mark, P. L. Mesite, and T. T. Nguyen *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 119-124 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Ongoing research projects on the following topics are described: atmospheric optical communication systems for network environments, two photon coherent state light, atmospheric propagation effects on infrared radars, and semiconductor lasers. R.S.F.

N84-33356# Massachusetts Inst. of Tech., Cambridge.
COMMUNICATION NETWORKS **c32**
R. S. Kennedy, S. S. Wagner, and E. B. Sia *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 125-127 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

A research program to determine and demonstrate the principles to be followed in the design of local communication networks as typified by local area networks, private branch exchanges and internetted collections of such structures is planned. Two fundamental assumptions distinguish the research from much of the ongoing work: (1) a single integrated system is to provide a set of highly diverse communication services such as interactive terminal service, data base access, file transfers, graphics, and voice and video; and (2) a single mode optical fiber links with very wide bandwidths is economical. These assumptions are not satisfied by the networks now being designed, but based upon the perceived trend toward such integrated diverse services and the declining cost of single mode fiber technology. It is planned for the research to involve theoretical, experimental, and design activities. Author

N84-33357# Massachusetts Inst. of Tech., Cambridge.
DIGITAL SIGNAL PROCESSING **c32**
A. V. Oppenheim, A. B. Baggeroer, J. S. Lim, B. R. Musicus, D. R. Mook, G. L. Duckworth, T. E. Bordley, S. R. Curtis, D. S. Deadrick, W. P. Dove et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 129-145 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Signal and image processing research projects are described. Topics include: (1) modeling underwater acoustic propagation; (2) image restoration; (3) signal reconstruction; (4) speech enhancement; (5) pitch detection; (6) spectral analysis; (7) speech synthesis; (8) speech enhancement; (9) autoregressive spectral estimation; (10) knowledge based array processing; (11) speech analysis; (12) estimating the degree of coronary stenosis with image processing; (13) automatic target detection; and (14) video conferencing. R.S.F.

N84-33358# Massachusetts Inst. of Tech., Cambridge.
SPEECH COMMUNICATION **c32**
Kenneth N. Stevens, J. Allen, M. Halle, S. J. Keyser, Victor W. Zue, Z. Andrade, D. Bradley, Martha Danly (Wang Labs., Inc.), F. Grosjean (Northeastern Univ.), S. Hawkins (Haskins Labs.) et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 147-157 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

characteristics of speech communication are investigated. Topics include the acoustic properties of different languages, speech error patterns, auditory models and speech processing, speech production physiology, speech recognition, and computer based speech research facilities. M.A.C.

N84-33359# Massachusetts Inst. of Tech., Cambridge.
LINGUISTICS **c32**
A. N. Chomsky, J. A. Fodor, M. F. Garrett, K. L. Hale, Morris Halle, J. W. Harris, S. J. Keyse, R. P. V. Kiparsky, J. R. Ross, and D. Archangeli *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 159-167 (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Linguistic studies of phonology, syntax and word formation, language models, and restructuring processes in grammar are discussed. Emphasis is placed on syntactic theory based on the theory of government and binding as well as lexical functional grammar. M.A.C.

N84-33360# Massachusetts Inst. of Tech., Cambridge.
COGNITIVE INFORMATION PROCESSING **c82**
W. F. Schreiber, D. E. Troxel, C. W. Lynn, L. Picard, K. P. Wacks, Yao-Ming Chao, Malik Khan, Qiding Du, D. Corteselli, and J. Ward *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 169-172 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Discussions on cognitive information processing are presented that emphasize picture coding, computer graphics applications and architectures, and automated engraving of gravure printing. These image processing techniques involve numerical control, software engineering, and digital to analog conversion of the visual data. M.A.C.

N84-33361# Massachusetts Inst. of Tech., Cambridge.
CUSTOM INTEGRATED CIRCUITS **c33**
Jonathan Allen, L. A. Glasser, Paul Penfield, Jr., Ronald Rivest, Gerald J. Sussman, J. L. Wyatt, Howard Shrobe, Jr., R. Armstrong, C. Bamji, C. Hauck et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 173-179 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Techniques of integrated circuit design are examined. Topics include the interrelatedness of architectural forms and transformations between these representations, theories for very large scale integrated circuits (VLSI), and fast timing analysis of VLSI circuits using waveform bounding. M.A.C.

N84-33362# Massachusetts Inst. of Tech., Cambridge.
COMMUNICATIONS BIOPHYSICS **c52**
Nelson Y. S. Kiang, William T. Peake, William M. Siebert, Thomas F. Weiss, M. C. Brown, R. A. Eatock, D. K. Eddington, J. J. Guinan, E. M. Keithley, J. B. Kobler et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 181-198 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

Topics on the biophysics of the auditory system are discussed. Research emphasis is placed on the anatomical structures and physiological mechanisms of vertebrate hearing and the associated clinical problems. Sound intensity perception, binaural hearing, hearing aid research, auditory discrimination, and the use of tactile sense as a hearing substitute are also examined. M.A.C.

N84-33363# Massachusetts Inst. of Tech., Cambridge.
PHYSIOLOGY **c52**
Jerome Y. Lettvin, J. Gardner, S. Jhaveri, L. A. Kamentsky, D. Perlman, G. M. Plotkin, S. A. Raymond, S. Wiesner, G. Geiger, L. R. Carley et al *In its* RLE Progr. Rept. No. 126 Jan. 1984 p 199-224 refs (For primary document see N84-33336 22-99)
Avail: NTIS HC A12/MF A01

The physiology of sight and image processing is discussed. Investigations of nervous signals, texture sensing, photoreceptor models, image enhancement under textural masking, treatment of Caisson Disease, quantum cryptography, and the development of an improved eye chart are examined. M.A.C.

N84-33364*# National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICS AND SPACE REPORT OF THE PRESIDENT, 1983 ACTIVITIES
[1984] 101 p
(NASA-TM-85538; NAS 1.15:85538) Avail: NTIS HC A06/MF A01 CSCL 05A

Achievements in communication; space science; space transportation; aeronautics; and Earth resources and environment are summarized. Activities of the various Federal agencies and cooperation with NASA in these areas are described. The Presidential policy announcement on the endorsement of commercial operation of expendable launch vehicles is included. Tables show, the space activities budget; a historical budget summary, U.S. space launch vehicles; U.S. and Soviet manned spaceflights, 1961 to 1983; U.S. launched space probes, 1975 to 1983; U.S. launched scientific and applications satellites, 1978 to 1983; the U.S. spacecraft record; the world record of space launches successful in attaining Earth orbit or beyond; and successful U.S. launchings for 1983. A.R.H.

N84-33365*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

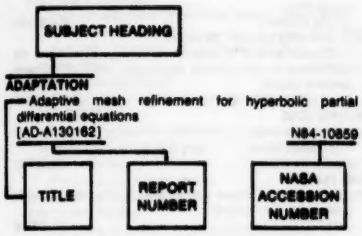
NASA AMES SUMMARY HIGH SCHOOL APPRENTICESHIP RESEARCH PROGRAM, 1983 RESEARCH PAPERS Report, 13 Jun. - 19 Aug. 1983

Patricia Powell Aug. 1984 141 p refs
(NASA-TM-85931; A-9689; NAS 1.15:85931) Avail: NTIS HC A07/MF A01 CSCL 05I

Engineering enrollments are rising in universities; however, the graduate engineer shortage continues. Particularly, women and minorities will be underrepresented for years to come. As one means of solving this shortage, Federal agencies facing future scientific and technological challenges were asked to participate in the Summer High School Apprenticeship Research Program (SHARP). This program was created 4 years ago to provide an engineering experience for gifted female and minority high school students at an age when they could still make career and education decisions. The SHARP Program is designed for high school juniors (women and minorities) who are U.S. citizens, are 16 years old, and who have unusually high promise in mathematics and science through outstanding academic performance in high school. Students who are accepted into this summer program will earn as they learn by working 8 hours a day in a 5-day work week. This work-study program features weekly field trips, lectures and written reports, and job experience related to the student's career interests. Author

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

A

ABERRATION
The correction of aberrations computed in the aperture plane of multifrequency microwave radiometer antennas
[NASA-TM-86090] N84-32679
ABRASION RESISTANCE
Microstructure, mechanical properties and two-body abrasive wear resistance of an Fe-3Cr-C based ultra-high strength steel
[DE84-014605] N84-32520
ABRASIVES
Coatings on diamond and CBN abrasives (review of inventions)
[CSIR-TRANS-1742] N84-32525
Development and testing of glass coatings for Hexanite-A powders
[CSIR-TRANS-1747] N84-32527
Economical grinding of steel and sintered carbides using superhard abrasives and high temperature-resistant bonds
[CSIR-TRANS-1744] N84-32562
ABSORBENTS
Adsorbent regenerator
[DE84-012969] N84-32468
ABSORPTION
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007
ABSORPTION SPECTRA
Dynamics of large molecules and molecular clusters
[AD-A143386] N84-32542
X-ray spectroscopy of solids under pressure
[DE84-013790] N84-33237
Observations of the ultraviolet spectra of helium (DB) white dwarfs and a study of the ultraviolet spectra of white dwarfs containing carbon
[NASA-CR-173889] N84-33310
ABSORPTIVITY
Improved heat exchanger for electrothermal devices
[NASA-CASE-LEW-14037-1] N84-32425
ABSTRACTS
European scientific notes, Volume 38, Number 7
[AD-A143238] N84-33267
ABUNDANCE
The ionization structure of planetary nebulae V NGC 3242
[NASA-CR-173914] N84-33322
Identification of gamma-ray lines observed from SS433
[DE84-013829] N84-33335
ACCELERATED LIFE TESTS
Analysis of lead-acid battery deep-cycle accelerated testing data
[DE84-013192] N84-32736
ACCELERATION (PHYSICS)
An investigation of a new flight test method for measuring the performance of general aviation aircraft N84-32375
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
ACCELERATION TOLERANCE
Visual field perimeter and psychomotor tracking performance measuring apparatus
[AD-D011056] N84-32775
ACCELERATORS
Research and development of a plasma jet mass accelerator as a driver for impact fusion
[DE84-012940] N84-33198
ACCUMULATORS
Programmable signal processing device
[AD-D011109] N84-32673
ACCURACY
Evaluation of the limiting accuracy in determining the coordinates of a point light source by a television tracking system using an image dissector with the presence of a nonstationary current component N84-32613
The exponential accuracy of Fourier and Tchebyshev differencing methods
[NASA-CR-172435] N84-33108
ACETATES
Electrically conducting poly(vinyl acetate)
[AD-A143199] N84-32538
ACETYLENE
Protected ethynylated phenols
[AD-D011096] N84-32544
ACOUSTIC EMISSION
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32650
ACOUSTIC LEVITATION
Containerless high purity pulling process and apparatus for glass fibers
[NASA-CASE-MFS-25905-2] N84-32569
Development of the sonic pump levitation
[NASA-CR-161963] N84-32749
ACOUSTIC MEASUREMENT
A study of heat release rate distribution in a gas turbine combustor by acoustic measurements N84-32385
The prediction of acoustical particle motion using an efficient polynomial curve fit procedure
[NASA-CR-173915] N84-33145
ACOUSTIC PROPAGATION
Noise measurement flight test: Data-analyses Aerospatiale SA-365N Dauphin 2 helicopter
[AD-A143229] N84-33151
ACOUSTIC PROPERTIES
Noise measurement flight test: Data-analyses Aerospatiale SA-365N Dauphin 2 helicopter
[AD-A143229] N84-33151
ACOUSTIC SCATTERING
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32674
ACOUSTICAL HOLOGRAPHY
A study of methods to predict and measure the transmission of sound through the walls of light aircraft. A survey of techniques for visualization of noise fields
[NASA-CR-173917] N84-33146
ACOUSTICS
JT15D simulated flight data evaluation
[NASA-CR-172322] N84-32387
Speech communication N84-33358
ACOUSTO-OPTICS
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
ACRYLATES
Properties of UV-cured polyurethane acrylates: Effect of polyol type and molecular weight
[AD-A143178] N84-32537
Properties of UV-curable polyurethane acrylates: Effect of reactive diluent
[AD-A143241] N84-32540
ACRYLONITRILES
Locating and estimating air emissions from sources of acrylonitrile
[PB84-200609] N84-32934
ACTIVATION ENERGY
Association and bound motion in alkali metal doped cadmium fluoride
[AD-A143200] N84-32450
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers
[AD-A143202] N84-32451
ACTIVE CONTROL
Validation of an Active Gear, Flexible Aircraft Take-off and Landing analysis (AGFATL)
[NASA-TP-2353] N84-32378
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173880] N84-32395
Controller technique of compensation figured in an active control scheme on the accumulated effects of deviation in the modeling
[INPE-2987-TDL/152] N84-33100
ACTUATORS
Low temperature evaluation of advanced technology hydraulic system (8,000 psi)
[AD-A143389] N84-32396
Effect of thermal aging on the output of a pyrotechnic actuator
[DE84-012903] N84-32558
Analysis, testing, and evaluation of faulted and unfaulted Wye, Delta, and open Delta connected electromechanical actuators
[NASA-CR-171808] N84-32707
ADA (PROGRAMMING LANGUAGE)
ADA (trademark) training curriculum. Programming methodology m203 teacher's guide
[AD-A143581] N84-33082
ADAPTATION
Oxygen affinity of hemoglobin, 3 hours after passive increase in altitude from 400 to 1600 metres
[RAE-TRANS-2118] N84-33004
ADAPTIVE FILTERS
Relations between algorithms of adaptive optimization of antenna arrays and algorithms of optimum detection of multidimensional stochastic signal N84-32586
ADDITIVES
Microbiology and food program N84-32999
Effect of surface doping on the oxidation of chromia former alloys
[DE84-013390] N84-33247
ADENOSINE TRIPHOSPHATE
Effects of insulin and hydrocortisone on energy metabolism in rats irradiated with fast, 60 MeV neutrons N84-33002
ADHESION
Metal coating of diamond abrasives (review of foreign patents)
[CSIR-TRANS-1740] N84-32489
Effect of formation conditions and contact zone structure on adhesion strength of carbide forming metal coatings on diamond
[CSIR-TRANS-1735] N84-32492
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535

ADHESIVE BONDING
Structural pressure sensitive silicone adhesives
[NASA-CASE-LAR-13270-1] N84-32532
Swedish research in high-temperature ceramics, superalloys N84-33142
ADHESIVES
Method of making compartmented, filament wound, one-piece aircraft fuel tanks
[AD-D011144] N84-32376
ADIABATIC CONDITIONS
HF prediction using adiabatic invariant theory
[AD-A143239] N84-32652
Steam bottoming cycle for an adiabatic diesel engine
[NASA-CR-168255] N84-33304
ADSORPTION
Chemical reaction dynamics at surfaces N84-33340
AERIAL RECONNAISSANCE
Quantitative interpretation of aeromagnetic anomalies in the Sinclinal Gandarela
[INPE-3070-PRE/487] N84-32896
AERODYNAMIC CHARACTERISTICS
Aerothermodynamic data base
[NASA-CR-171807] N84-32415
Investigation into the internal aerodynamic design and associated errors in a fast descent ducted sonde for the measurement of atmospheric pressure and temperature (AMPARS phase 2)
[AD-A143189] N84-32969
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 2: Laser velocimeter data
[NASA-CR-168234-VOL-2] N84-33149
AERODYNAMIC CONFIGURATIONS
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353
Design of a composite wing extension for a general aviation aircraft
[NASA-CR-173632] N84-32377
Computer studies of hybrid-slotted working sections with minimum interference at subsonic speeds
[NASA-TM-86002] N84-32379
A mathematical simulation model of the CH-46B helicopter, volume 2
[NASA-TM-84351] N84-32380
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173660] N84-32395
AERODYNAMIC DRAG
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173660] N84-32395
The nature and origin of refractory inclusions in the Allende meteorite N84-33318
AERODYNAMIC FORCES
Investigation of the external flow analysis for density measurements at high altitude — shuttle upper atmosphere mass spectrometer experiment
[NASA-CR-173661] N84-32352
AERODYNAMIC HEATING
Aerodynamic heating computations for projectiles. Volume 1: In-depth heat conduction modifications to the ABRES shape change code (BRLASCC)
[AD-A143252] N84-32359
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC)
[AD-A143253] N84-32360
Aerodynamic heating computations for projectiles. Volume 3: BRL interactive plotting program (BRLINPLOT)
[AD-A143254] N84-32361
A study of leeside flow field heat transfer on Shuttle Orbiter configuration
[NASA-CR-172362] N84-32410
Columbia: The first five flights. Entry heating data series. Volume 6: The upper leeside surface centerline
[NASA-CR-171795] N84-32414
AERODYNAMIC LOADS
NASA rotor system research aircraft flight-test data report: Helicopter and compound configuration
[NASA-TM-85843] N84-32381
Aerothermodynamic data base
[NASA-CR-171807] N84-32415
AERODYNAMIC STABILITY
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173660] N84-32395
AERODYNAMICS
Aeronautical Engineering: A continuing bibliography with indexes (supplement 177)
[NASA-SP-7037(177)] N84-32342
AEROELASTICITY
Summary of recent NASA propeller research
[NASA-TM-83733] N84-32344
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353
AEROMAGNETISM
Quantitative interpretation of aeromagnetic anomalies in the Sinclinal Gandarela
[INPE-3070-PRE/487] N84-32896
AERONAUTICAL ENGINEERING
Aeronautical Engineering: A continuing bibliography with indexes (supplement 177)
[NASA-SP-7037(177)] N84-32342
Aeronautical Engineering: A Continuing Bibliography with indexes
[NASA-SP-7037(178)] N84-32343
The 1985 NASA authorization, volume 2
[GPO-34-202] N84-33301
Aeronautics and space report of the President, 1983 activities
[NASA-TM-85536] N84-33364
AERONAUTICAL SATELLITES
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 1: System description and test results
[PB84-184621] N84-32412
AEROSOLS
The climatic impact of volcanic activity N84-32963
Aerosol measurements at an optical propagation site on the Outer Hebrides
[AD-A143564] N84-32972
Plasma-particle interaction effects in induction plasma modelling under dense loading conditions
[DE84-013388] N84-33203
AEROSPACE ENGINEERING
Shuttle detached spacecraft
[AD-A143320] N84-32417
West Europe report: Science and technology
[JPRS-WST-84-030] N84-33141
Spinoff, 1984
[NASA-TM-85596] N84-33305
AEROSPACE ENVIRONMENTS
DC (Direct-Current) partial-discharge-environmental screening of space TWTs (Traveling Wave Tubes)
[AD-A143230] N84-32710
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts N84-32998
National Aeronautics and Space Administration Authorization Act, 1985
[PUB-LAW-98-361] N84-33303
AEROSPACE MEDICINE
Aerospace Medicine and Biology: A continuing bibliography with indexes
[NASA-SP-7011(262)] N84-33003
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Review of occupational medicine relevant to aviation medicine N84-33012
Visual perception in systems management in aeronautics N84-33017
AEROSPACE SCIENCES
Aeronautics and space report of the President, 1983 activities
[NASA-TM-85536] N84-33364
AEROSPACE SYSTEMS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-008] N84-32580
AEROSPACE TECHNOLOGY TRANSFER
Spinoff, 1984
[NASA-TM-85596] N84-33305
AEROTHERMODYNAMICS
Columbia: The first five flights. Entry heating data series. Volume 6: The upper leeside surface centerline
[NASA-CR-171795] N84-32414
Aerothermodynamic data base
[NASA-CR-171807] N84-32415
AEROTHERMOELASTICITY
Four new capabilities in NASTRAN for dynamic and aeroelastic analyses of rotating cyclic structures N84-32676
AFTERGLOWS
Chemistry of energetic fragments: Hypovalent radicals
[AD-A143269] N84-32453
AGING (MATERIALS)
Effect of thermal aging on the output of a pyrotechnic actuator
[DE84-012903] N84-32558
AGRICULTURE
Agriculture and water use: Present and future issues
[GPO-30-599] N84-32697
Geomorphic approach to hydrograph synthesis, with potential for application to ungaged watersheds
[PB84-190115] N84-32904
Agriculture weather services
[GPO-27-913] N84-32966
Workshop on Systems Analysis
[PB84-194661] N84-33139
AIR
Static thrust augmentation of rocket motors by air entrainment
[AD-A143179] N84-32430
Conditional velocity statistics in premixed CH-4-air and C-2H-4-air turbulent flames
[DE84-012257] N84-32464
Passive sampling device for ambient air and personal monitoring
[PB84-210046] N84-32706
AIR BAG RESTRAINT DEVICES
Development of 2 underseat energy absorbers for application to crashworthy passenger seats for general aviation aircraft
[NASA-CR-156927] N84-32367
AIR FILTERS
High-efficiency particulate air filter behavior at high-speed flows
[DE84-014137] N84-32769
AIR FLOW
Axisymmetric thrust augmenting ejector with discrete primary air slot nozzles
[AD-D011129] N84-32366
JT15D simulated flight data evaluation
[NASA-CR-172322] N84-32367
Pin rooted blade biaxial air seal
[AD-D011066] N84-32391
AIR POLLUTION
Mathematical model of electrostatic precipitation (revision 3). Volume 1: Modeling and programming
[PB84-212679] N84-32469
Field surveys of carbon monoxide in commercial settings using personal exposure monitors
[PB84-211291] N84-32797
Locating and estimating air emissions from sources of acrylonitrile
[PB84-200609] N84-32934
Locating and estimating air emissions from sources of chloroform
[PB84-200617] N84-32935
Locating and estimating air emissions from sources of carbon tetrachloride
[PB84-200625] N84-32936
AIR QUALITY
National environmental monitoring
[GPO-28-186] N84-32933
Urban scale variations of turbulence parameters and fluxes
[PB84-209113] N84-32960
AIR SAMPLING
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers
[AD-A143319] N84-32959
AIR SEA ICE INTERACTIONS
Bering Air-Sea-Ice Study (BASICS), February and March, 1981
[PB84-196161] N84-32903
AIR TRAFFIC CONTROL
Thunderstorm impact on Denver air traffic control operations and the role of NEXRAD (Next Generation Weather Radar)
[PB84-189729] N84-32374
Array processor utilization in the computation of real-time images
[ARL-SYS-TM-73] N84-33058
Oversight on the Federal Aviation Administration fiscal year 1985 research, engineering and development budget request
[GPO-34-924] N84-33302
AIR WATER INTERACTIONS
Southern oscillation-El Nino events: Characteristics, evolution, and precipitation anomalies
[INPE-2976-PRE/438] N84-32963
AIRBORNE EQUIPMENT
Future requirements for airborne simulation
[AGARD-AR-188] N84-32401
AIRCRAFT ACCIDENTS
Aircraft accident report. Midair collision: McDonnell-Douglas F-4C Beech D-55 Baron, Cherry Point, North Carolina, 9 January 1983
[PB84-910407] N84-32368
AIRCRAFT ANTENNAS
Radio frequency distribution assembly
[AD-A143575] N84-32658
AIRCRAFT CONSTRUCTION MATERIALS
Aeronautical Engineering: A Continuing Bibliography with indexes
[NASA-SP-7037(178)] N84-32343
AIRCRAFT CONTROL
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173660] N84-32395

AIRCRAFT DESIGN
Aeronautical Engineering: A Continuing Bibliography with indexes
[NASA-SP-7037(178)] N84-32343
Turbine blade and vane heat flux sensor development, phase 1
[NASA-CR-168297] N84-32790
The need for biaxial fatigue testing at A.R.L.
[AD-A143203] N84-32878

AIRCRAFT ENGINES
Perfluoroalkylether substituted phenyl phosphines
[AD-D011122] N84-32529
Swedish research in high-temperature ceramics, superalloys N84-33142

AIRCRAFT EQUIPMENT
Position and restraint system for aircrewman
[AD-D011058] N84-32364
Low temperature evaluation of advanced technology hydraulic system (8,000 psi)
[AD-A143389] N84-32396
Piezoelectric deicing device
[NASA-CASE-LEW-13773-2] N84-32762

AIRCRAFT FUELS
Summary of recent NASA propeller research
[NASA-TM-83733] N84-32344
Method of making compartmented, filament wound, one-piece aircraft fuel tanks
[AD-D011144] N84-32376

AIRCRAFT HAZARDS
Lightning swept-stroke attachment patterns and flight conditions for storm hazards 1981
[NASA-TM-86279] N84-32365
A research study of the assessment of escape impairment by irritant combustion gases in postcrash aircraft fires
[FAA-CT-84-16] N84-32366

AIRCRAFT HYDRAULIC SYSTEMS
Low temperature evaluation of advanced technology hydraulic system (8,000 psi)
[AD-A143389] N84-32396

AIRCRAFT LANDING
Aircraft landing dynamics facility carriage weld test program
[NASA-TM-85802] N84-32827

AIRCRAFT MAINTENANCE
Artificial Intelligence-Robotics applications to Navy aircraft maintenance
[AD-A143219] N84-32345

AIRCRAFT NOISE
Application of stiffened cylinder analysis to ATP interior noise studies
[NASA-CR-172364] N84-33147
Noise measurement flight test: Data-analyses Aerospatiale SA-365N Dauphin 2 helicopter
[AD-A143229] N84-33151

AIRCRAFT POWER SUPPLIES
Handling of hydrazine in the Royal Danish Air Force N84-33014

AIRCRAFT SAFETY
Handling of hydrazine in the Royal Danish Air Force N84-33014

AIRCRAFT STRUCTURES
Aeronautical Engineering: A Continuing Bibliography with indexes
[NASA-SP-7037(178)] N84-32343
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173680] N84-32395
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535
The need for biaxial fatigue testing at A.R.L.
[AD-A143203] N84-32878

AIRFOILS
Improvements in the accuracy and stability of algorithms for the small-disturbance and full-potential equations applied to transonic flows
[NASA-TM-85970] N84-32350
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85980] N84-32358
Calculation of the pressure distribution on a pitching airfoil with application to the Darrieus rotor
[DE84-013571] N84-32363

AIRFRAMES
Validation of an Active Gear, Flexible Aircraft Take-off and Landing analysis (AGFATL)
[NASA-TP-2353] N84-32378
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535

AIRLINE OPERATIONS
Legislation needed to clarify future of consumer protection and federal preemption after the Civil Aeronautics Board sunsets
[PB84-210103] N84-32371

ALABAMA
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892

ALASKA
Topographic effects of the Alaskan stream on shelf currents
[PB84-205137] N84-32988
Alaska Land Conveyance Program: A slow, complex and costly process
[PB84-207265] N84-33294

ALGORITHMS
Flight Experiment Demonstration System (FEDS): Mathematical specification
[NASA-CR-175252] N84-32405
The Record of Electrical and Communication Engineering Conversazione, volume 53, no. 1, Jul. 1984
[ISSN-0385-7719] N84-32565
An automatic syntheses of hardware algorithm N84-32568
Adaptive analog-to-digital converter N84-32591
Performance simulation for unit-memory convolutional codes with byte-oriented Viterbi decoding algorithm N84-32630
A simple algorithm for the metric traveling salesman problem N84-32631
Error-trellis syndrome decoding techniques for convolutional codes N84-32633
On the finite element approximation of the stream function-vorticity equations
[AD-A143506] N84-32756
Computational fluid dynamics at the ICMA (Institute of Computational Mathematics and Applications)
[AD-A143510] N84-32759
A geographic information system for regional hydrologic modeling N84-32891
Manual and automated line generalization and feature displacement
[AD-A143250] N84-32900
Use of the tensor product for numerical weather prediction by the finite element method, part 1
[AD-A143273] N84-32970
Summary of research in applied mathematics, numerical analysis and computer science at the Institute for Computer Applications in Science and Engineering
[NASA-CR-172421] N84-33024
On the impact of communication complexity in the design of parallel numerical algorithms
[NASA-CR-172436] N84-33059
The Blue CHiP Project
[AD-A143474] N84-33065
Extending binary Byzantine agreement to multivalued Byzantine agreement
[AD-A143424] N84-33077
Dynamic programming and transitive closure on linear pipelines
[AD-A143527] N84-33079
Algorithms for error localization of discrete data
[DE84-014417] N84-33089
Basic geometric algorithms for use with graphic input
[DE84-013256] N84-33090
Simulation of large networks of processors by smaller ones
[AD-A143529] N84-33098
The least squares lattice algorithm: An alternate derivation with a discussion of numerical conditioning
[AD-A143439] N84-33114
Distributions of central quadratic forms in normal variables: A comparison of algorithms
[AD-A143468] N84-33116
High-order sparse factorization methods for elliptic boundary value problems
[DE84-012582] N84-33122
Accelerated convergence of the steepest-descent method for magnetohydrodynamic equilibria
[DE84-013602] N84-33195
Digital signal processing N84-33357

ALIGNMENT
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83785] N84-32789
Low loss splicing method for single-mode optical fiber
[NASA-CASE-NPO-16294-1] N84-33179

ALKANES
Liquid and solid phase compositions in a partially frozen jP-5 fuel low in n-alkanes
[AD-A143390] N84-32553

ALLENDE METEORITE
The nature and origin of refractory inclusions in the Allende meteorite N84-33318

ALLOYS
Method to reveal microstructures in single phase alloys
[AD-D011094] N84-32512
Processing and consolidation of rapidly solidified alloys: A technology assessment
[DE84-014673] N84-32523

ALLUVIUM
Aggradation and degradation at alluvial-channel beds
[PB84-201557] N84-32905

ALTIMETERS
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372

ALTITUDE
Oxygen affinity of hemoglobin, 3 hours after passive increase in altitude from 400 to 1800 metres
[RAE-TRANS-2118] N84-33004

ALUMINUM ALLOYS
Creep transitions in aluminum solid-solution alloys N84-32472
The importance of impact pressure in the development of the process of formation of bonds between metals in the solid phase
[BLL-M-35656-(5828.4)] N84-32473
Mechanical property data 7175-t736 aluminum alloy: Hand forging
[AD-A143328] N84-32511
Role of grain size on the brittle to ductile transition of the strongly ordered alloy Ni3Al
[DE84-014904] N84-32519

ALUMINUM CHLORIDES
Deactivation of thionyl chloride cells
[AD-D011113] N84-32908

ALUMINUM COATINGS
Solid-phase reaction of dispersed graphitized material with aluminium and nickel
[BLL-M-35633-(5828.4)] N84-32482

ALUMINUM GRAPHITE COMPOSITES
Loss factors measured in metal matrix composite materials
[AD-A143542] N84-32440

ALUMINUM OXIDES
Chemical stability of beta-aluminum
[DE84-009635] N84-32545

AMBIENT TEMPERATURE
Stress corrosion cracking of stainless steels in sea water at ambient temperature
[BLL-RISLEY-TRANS-4556-(9091.9)] N84-32476

AMBIGUITY
Fiber optic magnetometer for the detection of dc magnetic fields without hysteretic ambiguity
[AD-D011085] N84-32794

AMIDES
Synthesis and characterization of phosphorus-containing polyamides and copolyamides based on 1methyl}-2,4- and -2,6-diaminobenzenes
[NASA-TM-85877] N84-32431
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition
[AD-A143361] N84-33219

AMINES
A study of Beta-hydroxyamines and Beta-hydroxysulphides as corrosion inhibitors for metals
[BLL-T6313/BG/WH773/84] N84-32487

AMMONIA
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition
[AD-A143361] N84-33219

AMMONIUM CHLORIDES
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition
[AD-A143361] N84-33219

AMORPHOUS MATERIALS
Electronic properties of amorphous silicon dioxide N84-33351

AMORPHOUS SEMICONDUCTORS
Drift mobilities by time-of-flight methods and time-dependent phototransport in the nanosecond regime in amorphous semiconductors
[DE84-014906] N84-33241

AMPLIFICATION
The 64-m antenna automatic subreflector focusing controller N84-32628
Variable gain oven temperature control circuit
[AD-D011141] N84-32776
Research on output feedback control of systems with ill-conditioned dynamics
[NASA-CR-173921] N84-33071

AMPLIFIER DESIGN
Measurement amplifier
[NASA-CASE-MFS-25668-1] N84-32680
AMPLIFIERS
A high-performance hybrid RF isolation amplifier N84-32623
Magnetic refrigeration development N84-32626
High-intensity discharge (HID) solid-state ballast program: Engineering development report, phase 2
[DE84-013882] N84-32726
Temperature controlled gyro
[AD-D011136] N84-32777
AMPLITUDE MODULATION
Modulation of microwave power with electron transfer diodes N84-32610
Immunologic effects of electromagnetic fields (1961 - 1983)
[PB84-190602] N84-33008
AMPLITUDES
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619
Fatigue behavior of welded joints subjected to variable amplitude stresses
[PB84-207620] N84-32668
Onset of oscillations in symmetric convective states in a superfluid He-3-He-4 mixture
[DE84-009984] N84-33244
ANALOG TO DIGITAL CONVERTERS
Adaptive analog-to-digital converter N84-32591
Estimation of sensitivity threshold in integrating analog-to-digital converters with averaging of readings N84-32593
ANALYSIS (MATHEMATICS)
Least-squares smoothing of direct-exchange in zonal analysis
[DE84-002612] N84-32770
ANALYTIC FUNCTIONS
Annals of the Fourier Institute, volume 34, no. 1
[ISSN-0373-0956] N84-33025
Characterizations of zeros in the functions of some Nevanlinna type classes in the bidisk N84-33029
Wave fronts to infinity of real analytic functions N84-33031
The growth of plurisubharmonic functions in infinite domain N84-33033
Annals of the Fourier Institute, volume 34, no. 2
[ISSN-0373-0956] N84-33038
An application of fine potential theory to prove a Phragmen Lindeloef theorem N84-33043
Analytic automorphisms of a bounded Reinhardt domain in a complex Banach space with base N84-33044
The exponential accuracy of Fourier and Tchebyshev differencing methods
[NASA-CR-172435] N84-33108
ANALYZERS
Optical distortion analyzer system
[AD-D011127] N84-33176
ANECHOIC CHAMBERS
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 3: Shadowgraph photos and facility description
[NASA-CR-168234-VOL-3] N84-33150
ANEMOMETERS
Basic principles and recent observations of rotationally sampled wind
[DE84-013267] N84-32976
ANGULAR RESOLUTION
Angle resolution of wideband signals received by two slightly diverse linear antenna arrays N84-32582
Angular resolution of coherent and noncoherent sources
[AD-A143267] N84-33129
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control
[NASA-CR-173878] N84-33315
ANGULAR VELOCITY
Dynamics of angular movements of a solid supporting a rotating rotor with consideration of energy dissipation
[AD-A143349] N84-32681
ANIMALS
Publications of the NASA space biology program for 1960 - 1984 — bibliographies
[NASA-TM-86657] N84-32990
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010
ANISOTROPIC MEDIA
Intensity of radiowave scattering on anisotropic irregularities with various positions of scattering volume about caustic zone N84-32585
ANISOTROPY
Possible cosmological origin of the ultra high energy cosmic rays
[DE84-013063] N84-33334
ANNEALING
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors
[INPE-3045-TDL/157] N84-33212
Basic problems in InP technology
[AD-A143456] N84-33222
ANNULAR FLOW
Natural convection in porous media: An experimental and numerical study for vertical annular and rectangular enclosures N84-32744
ANNULAR SUSPENSION AND POINTING SYSTEM
Conceptual design of a noncontacting power transfer device for the ASPS Vernier system
[NASA-CR-172238] N84-32677
ANOMALIES
Aircraft liftmeter
[NASA-CASE-LAR-12518-1] N84-32383
High-speed thyristors on weakly doped GaAs N84-32600
The climatic impact of volcanic activity N84-32963
Southern oscillation-El Nino events: Characteristics, evolution, and precipitation anomalies
[INPE-2976-PRE/436] N84-32983
ANTENNA ARRAYS
Angle resolution of wideband signals received by two slightly diverse linear antenna arrays N84-32582
Relations between algorithms of adaptive optimization of antenna arrays and algorithms of optimum detection of multidimensional stochastic signal N84-32586
Symbol-stream combiner: Description and demonstration plans N84-32632
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket
[AD-A143266] N84-32653
Monolithic integrated antenna systems
[AD-A143184] N84-32708
Tactical high frequency array antennas
[AD-D011095] N84-32717
ANTENNA COMPONENTS
Around-a-mast quadrifilar microstrip antenna
[AD-D011051] N84-32617
Electronic Switching Spherical Array (ESSA) antenna systems
[NASA-TM-86127] N84-32621
Potential surface improvements by bump removal for 64-m antenna N84-32627
ANTENNA DESIGN
Synthesis of antennas with weak superdirectivity N84-32581
Around-a-mast quadrifilar microstrip antenna
[AD-D011051] N84-32617
The Telecommunications and Data Acquisition Report
[NASA-CR-173885] N84-32622
Optimization of antenna structure design N84-32624
Structural design of a vertical antenna boresight 18.3 by 18.3-m planar near-field antenna measurement system
[NASA-TM-83781] N84-32783
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83785] N84-32789
ANTENNA RADIATION PATTERNS
Synthesis of antennas with weak superdirectivity N84-32581
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket
[AD-A143266] N84-32653
Monolithic integrated antenna systems
[AD-A143184] N84-32708
Structural design of a vertical antenna boresight 18.3 by 18.3-m planar near-field antenna measurement system
[NASA-TM-83781] N84-32783
ANTENNAS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Around-a-mast quadrifilar microstrip antenna
[AD-D011051] N84-32617
The 64-m antenna automatic subreflector focusing controller N84-32628
ANTIOXIDANTS
Perfluoroalkylether substituted phenyl phosphines
[AD-D011122] N84-32529
Stabilized unsaturated polyesters
[NASA-CASE-NPO-16103-1] N84-32530
ANTIREFLECTION COATINGS
Wide spectrum antireflective coating for laser fusion systems
[DE84-013211] N84-32814
APEXES
Development of partially fluorinated resin apex seals
[NASA-CR-174706] N84-32828
APPROXIMATION
Approximation models for electrodynamic systems in solid state millimetric wave devices N84-32606
Numerical techniques for the prediction of flow induced orientation N84-32743
On the finite element approximation of the stream function-vorticity equations
[AD-A143506] N84-32758
AQUEOUS SOLUTIONS
Dielectric breakdown distributions of large dielectric constant liquids
[DE84-013216] N84-32481
ARC DISCHARGES
Magnetic fluorescent lamp
[DE84-014231] N84-32740
ARCHITECTURE (COMPUTERS)
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 3: Performance and simulation
[NASA-CR-175263] N84-32648
The design and performance of a parallel computer architecture for simulation N84-33054
Summary of research performed at MIT Laboratory for Computer Science
[AD-A143459] N84-33064
The Blue CHIP Project
[AD-A143474] N84-33065
The use of pipeline techniques in the architecture of digital processors employed in real time applications
[INPE-2992-TDL/153] N84-33075
The effect of queueing disciplines on response times in distributed systems
[DE84-012639] N84-33066
The NBS data management technology program N84-33277
Cognitive information processing N84-33360
Custom integrated circuits N84-33361
AREA
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
ARGON PLASMA
Spatial electron density and electric field strength measurements in microwave cavity experiments
[NASA-CR-173907] N84-32682
ARID LANDS
Agriculture and water use: Present and future issues
[GPO-30-599] N84-32897
ARITHMETIC AND LOGIC UNITS
Programmable arithmetic logic unit
[AD-D011128] N84-33055
ARKANSAS
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892
ARMED FORCES (FOREIGN)
Handling of hydrazine in the Royal Danish Air Force N84-33014
ARMED FORCES (UNITED STATES)
Photodigitizing procedures
[AD-A143589] N84-32793
IBM's token-ring LAN (Local-Area Network): A base-level communications solution
[AD-A143446] N84-33063
Analysis of benefits realized from multiyear contracting for the Black Hawk helicopter
[AD-A143485] N84-33254
ARRAYS
Kolmogorov's and Mourier's strong laws for arrays with independent and identically distributed columns
[AD-A143222] N84-33139
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183
ARTIFICIAL INTELLIGENCE
Artificial Intelligence-Robotics applications to Navy aircraft maintenance
[AD-A143219] N84-32345
Impact of robots and computers on the work force of the 1980's
[GPO-31-912] N84-32826
Summary of research performed at MIT Laboratory for Computer Science
[AD-A143459] N84-33064
Rand's experience in applying artificial intelligence techniques to strategic-level military-political war gaming
[P-6977] N84-33137
Intelligent infrared sensor
[BMFT-FB-T-84-092] N84-33189
ASSATEAGUE ISLAND (MD-VA)
Historical and projected shoreline changes: Ocean City and north Assateague Island, Maryland
[PB84-190206] N84-32967

ASSURANCE
Aircraft, ships, spacecraft, nuclear plants and quality [DE84-013262] N84-33166

ASTROMETRY
Solar variability observed through changes in solar figure and mean diameter [DE84-013914] N84-33328

ASTRONOMICAL MODELS
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314
Trapped particle absorption by the Ring of Jupiter [NASA-CR-173919] N84-33323
Possible cosmological origin of the ultra high energy cosmic rays [DE84-013063] N84-33334

ASTRONOMICAL OBSERVATORIES
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control [NASA-CR-173878] N84-33315

ASYMPTOTIC METHODS
Robust C(Alpha)-type tests for linear models [AD-A143177] N84-33125

ASYMPTOTIC PROPERTIES
Asymptotic relative efficiencies of the rank transformation procedure in randomized complete block designs [DE84-010600] N84-33134

ASYMPTOTIC SERIES
Distribution results for positive definite quadratic forms with repeated roots [AD-A143450] N84-33115

ATMOSPHERIC ATTENUATION
Aerosol measurements at an optical propagation site on the Outer Hebrides [AD-A143564] N84-32972

ATMOSPHERIC BOUNDARY LAYER
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964

ATMOSPHERIC CHEMISTRY
Proceedings of a Workshop on Polar Stratospheric Clouds: Their Role in Atmospheric Processes [NASA-CP-2318] N84-32952
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers [AD-A143319] N84-32959

ATMOSPHERIC CIRCULATION
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964
Southern oscillation-El Nino events: Characteristics, evolution, and precipitation anomalies [INPE-2976-PRE/438] N84-32983
Normal modes of the NCAR (National Center for Atmospheric Research) Community Forecast Model (CFM) [PB84-191220] N84-33094

ATMOSPHERIC COMPOSITION
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 26 km [NASA-CR-173879] N84-32951

ATMOSPHERIC DENSITY
Investigation of the external flow analysis for density measurements at high altitude — shuttle upper atmosphere mass spectrometer experiment [NASA-CR-173881] N84-32352
Solar tides in the mesospheric sodium layer [INPE-2942-TDL/151] N84-32953

ATMOSPHERIC DIFFUSION
Diffusion modeling with convective scaling and effects of surface inhomogeneities [PB84-210053] N84-32961

ATMOSPHERIC EFFECTS
Atmospheric propagation effects on infrared radars [AD-A143196] N84-32651
Optical propagation and communication N84-33355

ATMOSPHERIC ELECTRICITY
Mesoscale observations of lightning from Space Shuttle [NASA-TM-86451] N84-32788

ATMOSPHERIC ENTRY
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door [NASA-CR-171732] N84-32416

ATMOSPHERIC MODELS
Tropospheric delay effects in radio interferometry N84-32636
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers [AD-A143319] N84-32959
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964
Dynamic model of the Earth's upper atmosphere [NASA-CR-3835] N84-32965
Experiments in objective aviation weather forecasting using upper-level steering [AD-A143393] N84-32971
Studies in climate [PB84-196385] N84-32977
Diffusion modeling with convective scaling and effects of surface inhomogeneities [PB84-210053] N84-32961
Normal modes of the NCAR (National Center for Atmospheric Research) Community Forecast Model (CFM) [PB84-191220] N84-33094

ATMOSPHERIC MOISTURE
Two-dimensional finite amplitude mountain waves in the presence of moisture N84-32947
Studies in climate [PB84-196385] N84-32977

ATMOSPHERIC PRESSURE
Investigation into the internal aerodynamic design and associated errors in a fast descent ducted sonde for the measurement of atmospheric pressure and temperature (AMPARS phase 2) [AD-A143189] N84-32969

ATMOSPHERIC RADIATION
Science support for the Earth radiation budget sensor on the Nimbus-7 spacecraft [NASA-CR-175251] N84-32948
Proceedings of a Workshop on Polar Stratospheric Clouds: Their Role in Atmospheric Processes [NASA-CP-2318] N84-32952

ATMOSPHERIC TEMPERATURE
The climatic impact of volcanic activity N84-32963

ATOMIC ENERGY LEVELS
Relation of vertical intensity profiles for neutral atom lines to analyte atomization behavior in inductively coupled plasmas [DE84-014126] N84-33194

ATOMIC EXCITATIONS
Relation of vertical intensity profiles for neutral atom lines to analyte atomization behavior in inductively coupled plasmas [DE84-014126] N84-33194

ATOMIC STRUCTURE
Supersonic metal cluster beams [DE84-012976] N84-32516
Relativistic calculations and measurements of energies, Auger rates, and lifetimes [AD-A143423] N84-33220
Diamond surface: Atomic and electronic structure [DE84-013518] N84-33234
Local electronic properties of semiconductor surfaces and interfaces [DE84-013608] N84-33239

AUDIO EQUIPMENT
Underwater depth telemetry [AD-D011054] N84-32418

AUDIOLOGY
Communications biophysics N84-33362

AUDITORY DEFECTS
Communications biophysics N84-33362

AUDITORY PERCEPTION
Communications biophysics N84-33362

AUGER EFFECT
Relativistic calculations and measurements of energies, Auger rates, and lifetimes [AD-A143423] N84-33220

AURORAS
Influence of magnetic shear on the collisional current driven ion cyclotron instability [AD-A143391] N84-33191

AUSTENITE
Effect of precipitated austenite on the fracture of a ferritic cryogenic steel [DE84-014604] N84-32521

AUSTENITIC STAINLESS STEELS
Chromium-magnesium stainless steels, resistant to stress corrosion cracking in magnesium and calcium chloride solutions [BLL-RISLEY-TRANS-4571-(9091.9)] N84-32477
Stress corrosion cracking of austenitic stainless steels in sea water: An investigation of test methods [BLL-RISLEY-TRANS-4568-(9091.9)] N84-32478

AUTOCORRELATION
Autocorrelation receiver for Doppler short-range radar systems N84-32589

AUTOMATIC CONTROL
The Record of Electrical and Communication Engineering Conversazione, volume 53, no. 1, Jul. 1984 [ISSN-0385-7719] N84-32565
An automatic syntheses of hardware algorithm N84-32568
The 64-m antenna automatic subreflector focusing controller N84-32628
Development and characterization analysis of a radar polarimeter [NASA-CR-175259] N84-32785
Static methods in the design of nonlinear automatic control systems [AD-A143297] N84-33101
Assessment of trends of input actions of inertial objects [BLL-M-35689-(5828.4)] N84-33104
West Europe report: Science and technology [JPRS-WST-84-030] N84-33141

AUTOMATIC LANDING CONTROL
A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers [NASA-TM-85873] N84-32393

AUTOMATION
I/O channel interface [NBS-FIPS-PUB-60-2] N84-33057
Predictions of satisfaction with automated library circulation systems N84-33259
A study of the extent of automation in small college libraries and relationships of attitudes of library directors toward it N84-33260

AUTOMOBILE ENGINES
Automotive Stirling Engine Development Program. RESD summary report [NASA-CR-174674] N84-33307

AUTOMORPHISMS
Analytic automorphisms of a bounded Reinhardt domain in a complex Banach space with base N84-33044

AVALANCHE DIODES
Utilization of nonlinear properties of IMPATT-diodes in microwave devices (survey) N84-32603

AVIONICS
A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers [NASA-TM-85873] N84-32393
Definition, analysis and development of an optical data distribution network for integrated avionics and control systems. Part 2: Component development and system integration [NASA-CR-172429] N84-33181

AXIAL FLOW
Pin rooted blade biaxial air seal [AD-D011086] N84-32391

AXIAL FLOW TURBINES
Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine [NASA-TP-2309] N84-32388

AXIAL LOADS
Statistics of fracture of composite materials under multiaxial loading N84-32433

AXIAL MODES
A compact frequency-stable pulsed CO-2 laser [AD-A143216] N84-32806

AXISYMMETRIC BODIES
Representation of potential flow about axisymmetric bodies with discrete singularities [AD-A143526] N84-32760

B

BACK INJURIES
Position and restraint system for aircrewman [AD-D011058] N84-32364

BACKSCATTERING
Frequency correlation of HF skywave ground backscatter Doppler spectra [PB84-204353] N84-32668
Statistics at HF skywave ground backscatter Doppler spectra [PB84-204973] N84-32669
Wave propagation in dense geophysical media [AD-A143213] N84-32955
High-frequency acoustic backscatter from the sea surface [AD-A143536] N84-33152

BACTERIA
Unraveling photosystems [DE84-013812] N84-32994

BAFFLES
Flexible, resilient anti-contamination baffle [AD-D011111] N84-32421

BALL BEARINGS
Solid lubrication design methodology [NASA-CR-174690] N84-33309

BALLAST
High-intensity discharge (HID) solid-state ballast program: Engineering development report, phase 2 [DE84-013882] N84-32726

BALLISTICS
Textile ballistic performance (data base)
[AD-A143249] N84-32541
BALLOON SOUNDING
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km
[NASA-CR-173879] N84-32951
BANACH SPACE
Determinants connected with a trace on a Banach algebra N84-33038
Analytic automorphisms of a bounded Reinhardt domain in a complex Banach space with base N84-33044
Completely continuous multipliers from L sub 1 (G) into L sub infinity (G) N84-33047
Symbolic dynamics and nonlinear semiflows
[AD-A143487] N84-33117
Kolmogorov's and Mourier's strong laws for arrays with independent and identically distributed columns
[AD-A143222] N84-33130
BANDPASS FILTERS
Varying bandpass of optical spatial filter by rotating mirrors having changing reflectivity
[AD-D011114] N84-33173
BANDWIDTH
The 20 x 20 high speed microwave switches
[NASA-TM-83775] N84-32644
BARIUM
Determination of thermodynamic characteristics of the barium dissolution process in liquid iron
[BLL-M-35634-(5828.4)] N84-32481
BAROTROPIC FLOW
Topographic effects of the Alaskan stream on shelf currents
[PB84-205137] N84-32988
BARRIER LAYERS
High temperature electronics technology
[AD-A143571] N84-32514
BATCH PROCESSING
GCKP84-general chemical kinetics code for gas-phase flow and batch processes including heat transfer effects
[NASA-TP-2320] N84-32446
BAYS (STRUCTURAL UNITS)
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door
[NASA-CR-171732] N84-32416
BEAM INJECTION
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957
Experimental investigation of certain beam transport issues in a pulsed transmission line linear accelerator
[DE84-011191] N84-33164
BEAM SPLITTERS
Practical problems with CO2 laser radar tests
[RAE-TRANS-2113] N84-32804
BEAMS (RADIATION)
Laser beam duct pressure controller system
[AD-D011102] N84-32811
Beam recombination via cylindrical mirror
[AD-D011104] N84-32812
Angular resolution of coherent and noncoherent sources
[AD-A143287] N84-33129
BEAMS (SUPPORTS)
Supersonic metal cluster beams
[DE84-012976] N84-32516
Parameter estimation for the Euler-Bernoulli-beam
[NASA-CR-172417] N84-33107
BEARINGS
Mechanical interactions of rough surfaces
[DE84-014097] N84-32841
BEDS (GEOLOGY)
Aggradation and degradation at alluvial-channel beds
[PB84-201557] N84-32905
BEECHCRAFT AIRCRAFT
Aircraft accident report. Midair collision: McDonnell-Douglas F-4C Beech D-55 Baron, Cherry Point, North Carolina, 9 January 1983
[PB84-910407] N84-32368
BEHAVIOR
Fatigue behavior of welded joints subjected to variable amplitude stresses
[PB84-207620] N84-32586
An exploratory analysis of the relationship between media richness and managerial information processing
[AD-A143503] N84-33293
BELLOWS
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11534-1] N84-33021
BERING SEA
Bering Air-Sea-Ice Study (BASICS), February and March, 1981
[PB84-196161] N84-32903
BERYLLIUM ALLOYS
Pressure-dependent resistive behavior of YbBe13
[DE84-010066] N84-32514
BIBLIOGRAPHIES
Aeronautical Engineering: A continuing bibliography with indexes (supplement 177)
[NASA-SP-7037(177)] N84-32342
Aeronautical Engineering: A Continuing Bibliography with Indexes
[NASA-SP-7037(176)] N84-32343
Aerothermodynamic data base
[NASA-CR-171607] N84-32415
Publications of the NASA space biology program for 1980 - 1984 — bibliographies
[NASA-TM-86657] N84-32990
Aerospace Medicine and Biology: A continuing bibliography with indexes
[NASA-SP-7011(262)] N84-33003
Matrix management in DoD: An annotated bibliography
[AD-A143316] N84-33253
NASA Patents Abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 25)
[NASA-SP-7039(25)-SECT-2] N84-33257
BINARY ALLOYS
Process for the epitaxial deposition of III-V compounds utilizing a binary alloy as the metallic source
[AD-D011097] N84-33229
BINARY MIXTURES
Multicomponent diffusion under general chemical potential gradients
[DE84-010830] N84-32458
Maximum supercooling in liquid 3He-4He mixtures near the tricritical point
[DE84-010076] N84-33232
BINARY SYSTEMS (MATERIALS)
Two phase system; Interfacial turbulence
[AD-A143182] N84-32754
BINAURAL HEARING
Communications biophysics N84-33362
BIOCHEMISTRY
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies
[AD-A143507] N84-32992
BIODYNAMICS
Photodigitizing procedures
[AD-A143589] N84-32793
BIOENGINEERING
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-018] N84-32996
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts N84-32998
BIOLOGICAL EFFECTS
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts N84-32998
Aerospace Medicine and Biology: A continuing bibliography with indexes
[NASA-SP-7011(262)] N84-33003
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Hydrazine toxicology: Impact on safety and health in military aviation N84-33013
A comparative study in the animal of the toxicity of the combustion products of diverse materials N84-33015
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33016
Visual function and the definition of thresholds for exposure to laser radiation N84-33019
BIOLOGICAL MODELS (MATHEMATICS)
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995
Physiology N84-33363
BIOPHYSICS
RLE Progress Report no. 126
[RLE-PR-126] N84-33336
Communications biophysics N84-33362
BLOOD
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005
BLOOD PLASMA
Correlation between plasma fibronectin level and mortality following experimental rate heat stress
[AD-A143363] N84-32991
BODIES OF REVOLUTION
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
BODY TEMPERATURE
Mechanisms of thermoregulation of rats exposed to hypergravic fields N84-32989
BODY-WING AND TAIL CONFIGURATIONS
Fuselage and nozzle pressure distributions of a 1/12-scale F-15 propulsion model at transonic speeds. Effect of fuselage modifications and nozzle variables
[NASA-TP-2333] N84-32354
BOILERS
Eddy current testing of steam generator tubes
[BLL-RISLEY-TRANS-4584-(9091.9)] N84-32848
BOLTS
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32975
BONDING
Crack problems for bonded nonhomogeneous materials under antiplane shear loading
[NASA-CR-173892] N84-32983
BORON
Influence of microalloying with titanium and boron on cold resistance of structural steel
[BLL-M-35606-(5826.4)] N84-32483
Role of grain size on the brittle to ductile transition of the strongly ordered alloy Ni3Al
[DE84-014904] N84-32519
BORON HYDRIDES
Kinetics and mechanisms of thermolytic interconversions of boron hydrides
[AD-A143525] N84-32455
BORON NITRIDES
Development and testing of glass coatings for Hexanite-A powders
[CSIR-TRANS-1747] N84-32527
Structure of polycrystalline boron nitride as determined by electron microscopic thin sections
[CSIR-TRANS-1738] N84-32533
Economic use of CBN grinding tools in the production of jet turbine components
[CSIR-TRANS-1736] N84-32561
Economical grinding of steel and sintered carbides using superhard abrasives and high temperature-resistant bonds
[CSIR-TRANS-1744] N84-32562
EPR investigation of inclusions in cubic boron nitride crystals
[CSIR-TRANS-1752] N84-33207
BOSON FIELDS
Spherically symmetric radiation in gravitational collapse N84-33312
BOSONS
Axions, neutrinos and strings: The formation of structure in an SO(10) universe
[NASA-TM-86139] N84-33317
BOUNDARIES
Ekman boundary conditions for numerical models of centrifuge flows
[DE84-013576] N84-32765
On the boundary limits of harmonic functions with gradient in L sup p N84-33030
BOUNDARY LAYER COMBUSTION
Fuel injection device and method
[DE84-014320] N84-32846
BOUNDARY LAYER EQUATIONS
Three-dimensional, time-dependent, compressible, turbulent, integral boundary layer equations in general curvilinear coordinates and their numerical solutions N84-32348
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85980] N84-32358
BOUNDARY LAYER FLOW
The structure of the vorticity field in turbulent channel flow. Part 1: Analysis of instantaneous fields and statistical correlations
[NASA-TM-86019] N84-32753
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197995] N84-32773
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964
BOUNDARY LAYERS
Ekman boundary conditions for numerical models of centrifuge flows
[DE84-013576] N84-32765
Experimental and model transport and diffusion studies in complex terrain with emphasis on tracer studies
[DE84-013076] N84-32975
BOUNDARY LUBRICATION
Solid lubrication design methodology
[NASA-CR-174690] N84-33309
BOUNDARY VALUE PROBLEMS
Free bulging of round diaphragm exposed to uniform pressure in state of creep
[BLL-M-35680-(5826.4)] N84-32861
The time evolution of spectral discretizations of hyperbolic systems
[NASA-CR-172432] N84-33113

Stability analysis of finite difference schemes for hyperbolic systems, and problems in applied and computational linear algebra
[AD-A143537] N84-33119
High-order sparse factorization methods for elliptic boundary value problems
[DE84-012582] N84-33122

BRANCHING (MATHEMATICS)
Persistence of the Hopf bifurcation under singular perturbations
[DE84-013071] N84-33120

BRAZIL
Quantitative interpretation of aeromagnetic anomalies in the Sinclinal Gandarela
[INPE-3070-PRE/487] N84-32896
The severity of the Brazilian freeze of 1981 as monitored in real time by satellite
[INPE-2586-PRE/234] N84-32967
Aspects of the Brazil current system according to SMS-2, NOAA-6, and Tiros-N satellites for 1979 to 1980
[INPE-2975-RPE/450] N84-32982

BRAZING
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner
[NASA-CR-174691] N84-32504

BREADBOARD MODELS
A high-performance hybrid RF isolation amplifier N84-32623

BREAKDOWN
Breakdown processes in large-area cold-cathode vacuum triodes
[DE84-014026] N84-32817

BRIDGES (STRUCTURES)
Fatigue behavior of longitudinal transverse stiffener intersection
[PB84-202092] N84-32887
Fatigue behavior of welded joints subjected to variable amplitude stresses
[PB84-207620] N84-32888

BRIGHTNESS DISTRIBUTION
Microwave and X-ray observations of delayed brightenings at sites remote from the primary flare locations
[NASA-TM-86140] N84-33326

BRINES
Comparison between two Lyshoim engines
[DE84-013698] N84-32571
Diagenesis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938

BRITTLENESS
Role of grain size on the brittle to ductile transition of the strongly ordered alloy NiAl
[DE84-014904] N84-32519

BROADBAND
Angle resolution of wideband signals received by two slightly diverse linear antenna arrays N84-32562
The broad-band X-ray spectrum of a QSO sample
[NASA-TM-85071] N84-33333

BROADCASTING
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580

BROMIDES
Electrochemical performance of porous nickel sulfide electrodes
[DE84-009586] N84-32741

BROWNIAN MOVEMENTS
Brownian motion and random walks on manifolds N84-33051

BRUSHES
Friction and wear studies of liquid metal wetted, metallic fiber brushes
[AD-A143473] N84-32831

BUBBLES
Features of behaviour of gas bubbles in molten oxide films during enamelling
[BLL-M-35672-(5828.4)] N84-32496
The effects of porous material on microbubble skin friction reduction
[AD-A143401] N84-32756

BUCKLING
Simple examples of non linear truss behavior
[AD-A143368] N84-32882

BULGING
Free bulging of round diaphragm exposed to uniform pressure in state of creep
[BLL-M-35680-(5828.4)] N84-32861

BUOYANCY
Thermally induced instabilities of two-layer fluid systems N84-32745

BUOYS
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 1: System description and test results
[PB84-184621] N84-32412
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 2: Hardware circuitry and software programs
[PB84-184639] N84-32413

BURGER EQUATION
The well-posedness of the Kuramoto-Sivashinsky equation
[NASA-CR-172431] N84-33053

BUTANES
A comprehensive chemical kinetic reaction mechanism for the oxidation of n-butane
[DE84-005739] N84-32467

BYPASSES
Design and selection of bypass diodes N84-32688

C

C-135 AIRCRAFT
Development of the sonic pump levitation
[NASA-CR-161963] N84-32749

CADMIUM ALLOYS
Theory of the electronic properties of mercury-cadmium-telluride alloys
[AD-A143426] N84-33221

CADMIUM FLUORIDES
Association and bound motion in alkali metal doped cadmium fluoride
[AD-A143200] N84-32450

CADMIUM SULFIDES
CdS/CuInSe2 heterojunction cell research
[DE84-004506] N84-32926

CALCITE
Diagensis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938

CALCIUM
Chromium-magnesium stainless steels, resistant to stress corrosion cracking in magnesium and calcium chloride solutions
[BLL-RISLEY-TRANS-4571-(9091.9)] N84-32477

CALIBRATING
Air data position-error calibration using state reconstruction techniques
[NASA-TM-86029] N84-32384
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage
[DE84-012234] N84-32796
Development of color criteria for advanced displays
[AD-A143246] N84-33006
Target for optically activated seekers and trackers
[AD-D011059] N84-33171
NASA metrology information system: A NEMS subsystem N84-33279
Langley's views on NEMS N84-33280

CALIFORNIA
Field surveys of carbon monoxide in commercial settings using personal exposure monitors
[PB84-211291] N84-32797
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892

CALLISTO
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

CALORIMETERS
Electrical and differential scanning calorimetry studies of poly(ethylene oxide) complexed with alkaline earth thiocyanates
[AD-A143196] N84-32449
High energy physics research at Texas Agriculture and Mining University — magnetic monopoles in cosmic rays and hadron calorimeter design
[DE84-011616] N84-33167

CAMERAS
Method of measuring optical properties of a transparency
[AD-D011117] N84-33188

CAMS
The chemical and physical changes on lubricated surfaces N84-32620

CANCELLATION
Cascaded adaptive loops
[AD-D011116] N84-32674

CANONICAL FORMS
Canonic measurements in the classic moment problem N84-33041
Frequency response design methods for large scale systems
[DE84-013111] N84-33103

CANOPIES (VEGETATION)
Remote sensing for geobotanical prospecting N84-32889

CANTILEVER BEAMS
Loss factors measured in metal matrix composite materials
[AD-A143542] N84-32440

CAPACITORS
A 50 kJ repetitively pulsed capacitor bank
[DE84-012959] N84-32735

CAPACITY
Effects of standtime on the available capacity of lead-acid and nickel/iron electric vehicle batteries
[DE84-013452] N84-32721

CAPILLARY FLOW
Features of behaviour of gas bubbles in molten oxide films during enamelling
[BLL-M-35672-(5828.4)] N84-32496

CAPILLARY TUBES
Low loss splicing method for single-mode optical fiber
[NASA-CASE-NPO-16294-1] N84-33179

CARBENES
Chemistry of energetic fragments: Hypovalent radicals
[AD-A143269] N84-32453

CARBON
Observations of the ultraviolet spectra of helium (DB) white dwarfs and a study of the ultraviolet spectra of white dwarfs containing carbon
[NASA-CR-173889] N84-33310
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314

CARBON DIOXIDE
Carbon-13 and proton nuclear magnetic resonance analysis of shale-derived refinery products and jet fuels and of experimental referee broadened-specification jet fuels
[NASA-CR-174761] N84-32552

CARBON DIOXIDE LASERS
Practical problems with CO2 laser radar tests
[RAE-TRANS-2113] N84-32804
Laser furnace technology for zone refining
[NASA-TM-86459] N84-32805
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32806

CARBON MONOXIDE
Field surveys of carbon monoxide in commercial settings using personal exposure monitors
[PB84-211291] N84-32797

CARBON TETRACHLORIDE
Locating and estimating air emissions from sources of carbon tetrachloride
[PB84-200625] N84-32936

CARBONATES
Molten carbonate fuel cell performance model update
[DE84-012932] N84-32733

CARGO
Adjustable self-releasing hook
[AD-D011082] N84-32834

CARGO SPACECRAFT
Shuttle detached spacecraft
[AD-A143320] N84-32417

CARRIER MOBILITY
Infrared absorption spectrum of free carriers in polar semiconductors
[DE84-013276] N84-33248

CARRIER TRANSPORT (SOLID STATE)
Drift mobilities by time-of-flight methods and time-dependent phototransport in the nanosecond regime in amorphous semiconductors
[DE84-014906] N84-33241

CARRIER WAVES
Coherent digital demodulation of a residual carrier signal using IF sampling N84-32634

CARTAN SPACE
Fatou theorem for the proper functions of invariant potential operators by a group of Cartan displacements N84-33037

CASCADE FLOW
Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351
A linear aerodynamic analysis for unsteady transonic cascades
[NASA-CR-3833] N84-32355
Report of tests of a compressor configuration of CD (Controlled Diffusion) blading
[AD-A143499] N84-32832

CASSEGRAIN ANTENNAS
High power K sub a -band transmitter for planetary radar and spacecraft uplink N84-32625
Intermodulation product levels in flame-sprayed materials N84-32629

CAST ALLOYS
Procedure for the electroplating of sintered materials containing carbide or cast alloys of tungsten, molybdenum, titanium or zirconium
[BLL-RISLEY-TRANS-4557-(9091.9)] N84-32484

CASTING
Influence of direct current on temperature gradient in directionally solidifying ingot of alloy YuNDK35T5
[BLL-M-35684-(5828.4)] N84-32495
CASTINGS
A procedure for determining the tempo at which alloys solidify
[BLL-M-35842-(5828.4)] N84-32497
CATALOGS (PUBLICATIONS)
Submillimeter, millimeter, and microwave spectral line catalogue
[NASA-CR-173699] N84-32448
Notes for medical catalogers, 1983
[PB84-195874] N84-33296
CATALYSTS
A diffusion mechanism in the catalytic conversion of carbonaceous materials into diamonds at high pressures
[CSIR-TRANS-1743] N84-32526
Negative electrode catalyst for the iron-chromium REDOX energy storage system
[NASA-CASE-LEW-14026-1] N84-32909
CATHODE RAY TUBES
Comparison of CRT (Cathode Ray Tube) antireflection filters
[PB84-202753] N84-32742
Development of color criteria for advanced displays
[AD-A143246] N84-33006
Visual perception in systems management in aeronautics N84-33017
CATHODES
Electronically conductive ceramics for high temperature oxidizing environments
[DE84-014506] N84-32549
Solid state tetrachloroaluminate storage battery having a transition metal chloride cathode
[AD-D011133] N84-32924
CAUCHY PROBLEM
Uniqueness in the Cauchy problem for second order operators with real symbols N84-33045
CAUSTICS (OPTICS)
Intensity of radiowave scattering on anisotropic irregularities with various positions of scattering volume about caustic zone N84-32585
CAVITATION CORROSION
Characterization of erosion of metallic materials under cavitation attack in a mineral oil
[NASA-TP-2368] N84-32625
CAVITY RESONATORS
Beam cavity coupling impedance
[DE84-014064] N84-32662
Interferometrically tuned laser resonator
[AD-D011125] N84-32600
Autogenerator of beams of charged particles
[DE84-014242] N84-33163
CELESTIAL BODIES
Spinoff, 1984
[NASA-TM-85596] N84-33305
CELLS (BIOLOGY)
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995
Immunologic effects of electromagnetic fields (1981 - 1983)
[PB84-190602] N84-33008
Molecule microscopy N84-33337
CENTAUR LAUNCH VEHICLE
A high energy stage for the National Space Transportation System
[NASA-TM-83795] N84-32411
CENTRAL PROCESSING UNITS
Simulation of large networks of processors by smaller ones
[AD-A143529] N84-33098
CENTRIFUGAL CASTING
Low cost thermal protection system processing
[AD-D011142] N84-32434
Generalization of results of electro-simulation of temperature of the piece during centrifugal cladding
[BLL-M-35687-(5828.4)] N84-32479
CENTRIFUGAL COMPRESSORS
An improved method for the prediction of centrifugal compressor rotational-tone noise
[DE84-013345] N84-32842
CENTRIFUGAL PUMPS
Mechanical seal program
[DE84-012421] N84-32838
An improved method for the prediction of centrifugal compressor rotational-tone noise
[DE84-013345] N84-32842
CENTRIFUGES
Ekman boundary conditions for numerical models of centrifuge flows
[DE84-013576] N84-32765
CEPHEID VARIABLES
Some masses for population 1 and 2 cepheids
[DE84-014032] N84-33311
CERAMICS
Processing science to increase the reliability of ceramics
[AD-A143207] N84-32539
Electronically conductive ceramics for high temperature oxidizing environments
[DE84-014506] N84-32549
Ceramic component manufacturing technology development — silicon carbide tubing for industrial waste heat recovery
[PB84-215276] N84-32550
DC (Direct-Current) partial-discharge-environmental screening of space TWTs (Traveling Wave Tubes)
[AD-A143230] N84-32710
Swedish research in high-temperature ceramics, superalloys N84-33142
CEREBRUM
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005
CERENKOV RADIATION
Radiation from intense electron beams associated with the Cherenkov mechanism
[AD-A143350] N84-32657
Time development of Cerenkov radiation
[AD-A143225] N84-33155
CHALCOGENIDES
New materials from high temperature synthesis
[DE84-014125] N84-33231
CHANNEL CAPACITY
I/O channel interface
[NBS-FIPS-PUB-60-2] N84-33057
CHANNEL FLOW
The structure of the vorticity field in turbulent channel flow. Part 1: Analysis of instantaneous fields and statistical correlations
[NASA-TM-86019] N84-32753
CHANNELS (DATA TRANSMISSION)
Simulator-probe for diagnostic testing of short-wave radio channels N84-32595
Performance simulation for unit-memory convolutional codes with byte-oriented Viterbi decoding algorithm N84-32630
CHARACTER RECOGNITION
Search command for character strings and words in computer files on CMS (Conversational Monitor System)
[PB84-201243] N84-33068
CHARGE CARRIERS
High-speed thyristors on weakly doped GaAs N84-32600
Mechanisms of electrical conductivity in olivine
[DE83-017313] N84-32723
Infrared absorption spectrum of free carriers in polar semiconductors
[DE84-013276] N84-33248
CHARGE COUPLED DEVICES
Development of a spectroradiometer with a linear network of detectors from standard CCD
[INPE-3095-TDL/165] N84-33180
CHARGE DISTRIBUTION
Time development of Cerenkov radiation
[AD-A143225] N84-33155
CHARGE EFFICIENCY
Effects of standtime on the available capacity of lead-acid and nickel/iron electric vehicle batteries
[DE84-013452] N84-32721
CHARGED PARTICLES
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160
Autogenerator of beams of charged particles
[DE84-014242] N84-33163
CHEBYSHEV APPROXIMATION
The exponential accuracy of Fourier and Tchebyshev differencing methods
[NASA-CR-172435] N84-33106
The time evolution of spectral discretizations of hyperbolic systems
[NASA-CR-172432] N84-33113
CHEMICAL ANALYSIS
Composition and structure of multicomponent vanadium- and niobium-base coatings
[BLL-M-35657-(5828.4)] N84-32474
Obtaining iron-55 with high radiochemical purity
[CSIR-TRANS-1751] N84-32494
Low-chromium heat-resisting ferritic alloys strengthened by the Chi Phase
[PB84-199041] N84-32524
Investigation and rehabilitation to extend service life of DSS-13 antenna concrete foundation N84-32637
CHEMICAL COMPOSITION
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers
[AD-A143202] N84-32451
Cubic silicon nitride in iron-silicon steels
[BLL-M-35653-(5828.4)] N84-32486
Slavutich high-cobalt WC-Co-matrix alloy
[CSIR-TRANS-1739] N84-32490
Geology and origin of the Aquila iron deposit in southwestern Michoacan, Mexico N84-32690
The interpretation of very low frequency Raman scattering from roughened silver electrodes: Clusters, cavities or complexes?
[AD-A143471] N84-33184
Epitaxial crystallization in the Te-HgTe-CdTe system
[CSIR-TRANS-1745] N84-33206
CHEMICAL ENGINEERING
Review of solar fuel-producing quantum conversion processes
[NASA-CR-173904] N84-32916
Solar photochemical process engineering for production of fuels and chemicals
[NASA-CR-173910] N84-32917
CHEMICAL EQUILIBRIUM
The controlling reactions during interaction between silicon and carbon
[BLL-M-35673-(5828.4)] N84-32444
CHEMICAL LASERS
CW HF R-branch laser
[AD-D011120] N84-32613
CHEMICAL REACTIONS
The controlling reactions during interaction between silicon and carbon
[BLL-M-35673-(5828.4)] N84-32444
Influence of diluents and inhibitors on detonations
[DE84-006300] N84-32463
A comprehensive chemical kinetic reaction mechanism for the oxidation of n-butane
[DE84-005739] N84-32467
Topochemical reactions and the Stefan problem
[BLL-M-35671-(5828.4)] N84-32501
Cure reactions, network structure and mechanical response of diaminodiphenyl sulfone cured tetraglycidyl 4,4'diaminodiphenyl methane
[DE84-012607] N84-32548
Mechanisms involved in the glow-discharge deposition of doped hydrogenated amorphous silicon
[DE84-013124] N84-33236
CHEMICAL REACTORS
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
CHEMISORPTION
Quantum structure of adsorbates on semiconductor surfaces
[AD-A143465] N84-33223
Phase transitions in chemisorbed systems N84-33342
CHIPS (ELECTRONICS)
Three-dimensional circuit layouts
[AD-A143430] N84-32713
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 6
[NASA-CR-171126] N84-32780
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171128] N84-32949
The Blue CHIP Project
[AD-A143474] N84-33065
CHLORIDES
Chromium-magnesium stainless steels, resistant to stress corrosion cracking in magnesium and calcium chloride solutions
[BLL-RISLEY-TRANS-4571-(9091.9)] N84-32477
CHLOROAROMATICS
Cleavage of aromatic carbon-carbon bonds
[DE84-010161] N84-32432
CHLOROFORM
Locating and estimating air emissions from sources of chloroform
[PB84-200617] N84-32935
CHLOROPHYLLS
Unraveling photosystems
[DE84-013812] N84-32994
CHLOROPLASTS
Unraveling photosystems
[DE84-013812] N84-32994
CHOKES (FUEL SYSTEMS)
Fuel injection device and method
[DE84-014320] N84-32846
CHROMATOGRAPHY
Carbon-13 and proton nuclear magnetic resonance analysis of shale-derived refinery products and jet fuels and of experimental referee broadened-specification jet fuels
[NASA-CR-174761] N84-32552
CHROMIUM
Numerical calculations of the function of the static receptivity of electrons in metals
[BLL-M-35640-(5828.4)] N84-32480
Supersonic metal cluster beams
[DE84-012976] N84-32516

Negative electrode catalyst for the iron-chromium REDOX energy storage system
[NASA-CASE-LEW-14026-1] N84-32909
CHROMIUM ALLOYS
Fundamental alloy studies
[DE84-013941] N84-32513
Low-chromium heat-resisting ferritic alloys strengthened by the Chi Phase
[PB84-199041] N84-32524
CHRONOLOGY
Geology, petrology and geochronology of the metamorphic rocks of Meatiq Dome, Central Eastern Desert, Egypt N84-32942
CHUTES
Special features of the formation of a bed of polydispersed free-flowing materials
[BLL-M-35674-(5828.4)] N84-32747
CIRCADIAN RHYTHMS
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-018] N84-32996
Pilot jet lag experiments described N84-32997
CIRCLES (GEOMETRY)
Variability orderings related to coverage problems on the circle
[AD-A143364] N84-33130
CIRCUIT BOARDS
Three-dimensional circuit layouts
[AD-A143430] N84-32713
CIRCUIT PROTECTION
Source-circuit design overview N84-32684
Grounding and fault protection of the SMUD PVI array N84-32698
CIRCUITS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Measurement amplifier
[NASA-CASE-MFS-25668-1] N84-32680
Source-circuit design overview N84-32684
Source circuit design considerations N84-32690
Hipot and continuity qualification est experience N84-32692
Laborstory experience with voltage breakdown N84-32693
Three-dimensional circuit layouts
[AD-A143430] N84-32713
Variable gain oven temperature control circuit
[AD-D011141] N84-32778
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
CIRCULAR CONES
Supersonic flows around a circular cone with or without blowing on the surface
[AD-A143258] N84-32362
CIRCULAR CYLINDERS
Mass transfer from a circular cylinder: Effects of flow unsteadiness and slight nonuniformities
[NASA-CR-174759] N84-32751
CIRCULAR PLATES
Stresses and displacements in linear Maxwell non-isothermal circular plates on Winkler foundation and with radial and transverse variation in material properties N84-32656
CIRCULAR WAVEGUIDES
Compact broadband rectangular to coaxial waveguide junction
[AD-D011091] N84-32716
CITIES
Urban scale variations of turbulence parameters and fluxes
[PB84-209113] N84-32960
CIVIL AVIATION
Voluntary accounting systems for a small air carrier: Revenues, financial and traffic statistics
[PB84-210996] N84-32369
Economic cases of the Civil Aeronautics Board, volume 104, October - November 1983
[PB84-209287] N84-32370
Legislation needed to clarify future of consumer protection and federal preemption after the Civil Aeronautics Board sunsets
[PB84-210103] N84-32371
Definition, analysis and development of an optical data distribution network for integrated avionics and control systems. Part 2: Component development and system integration
[NASA-CR-172429] N84-33181
CLADDING
Weldability of steels: Study of cracking and methods of examination
[BLL-RISLEY-TRANS-4519-(9091.9)] N84-32475
Generalization of results of electro-simulation of temperature of the piece during centrifugal cladding
[BLL-M-35667-(5828.4)] N84-32479
CLASSIFICATIONS
A simulation of remote sensor systems and data processing algorithms for spectral feature classification
[NASA-CR-172393] N84-32784
Source hierarchy list. Volume 1: A through H
[AD-A143500] N84-33291
Source hierarchy list. Volume 2: I through Z
[AD-A143501] N84-33292
CLEANING
Low temperature epitaxial deposition of silicon by plasma enhanced CVD (Chemical Vapor Deposition)
[AD-A143208] N84-33216
CLEAVAGE
Cleavage of aromatic carbon-carbon bonds
[DE84-010161] N84-32432
CLIMATE
Science support for the Earth radiation budget sensor on the Nimbus-7 spacecraft
[NASA-CR-175251] N84-32948
Climate prediction. Part 1: Cyclone frequency
[AD-A143576] N84-32973
Southern oscillation-El Nino events: Characteristics, evolution, and precipitation anomalies
[INPE-2976-PRE/438] N84-32983
CLIMATOLOGY
The climatic impact of volcanic activity N84-32963
Studies in climate
[PB84-196385] N84-32977
CLINICAL MEDICINE
Modeling of lethal electric shock N84-33000
Handling of hydrazine in the Royal Danish Air Force N84-33014
CLOSURE LAW
On the closure of spaces of sums of ridge functions and the range of the X-ray transform N84-33035
CLOUD COVER
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964
CLOUDS
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314
CLOUDS (METEOROLOGY)
Turbulent diffusion, dissipation, and winds from calibrated photographs of artificial clouds
[AD-A143231] N84-32956
CLUMPS
Supersonic metal cluster beams
[DE84-012976] N84-32516
CMOS
Programmable arithmetic logic unit
[AD-D011128] N84-33055
COAL LIQUEFACTION
Cleavage of aromatic carbon-carbon bonds
[DE84-010161] N84-32432
Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556
COASTAL WATER
Historical and projected shoreline changes: Ocean City and north Assateague Island, Maryland
[PB84-190206] N84-32967
COATINGS
Composition and structure of multicomponent vanadium- and niobium-base coatings
[BLL-M-35657-(5828.4)] N84-32474
Development and testing of glass coatings for Hexanite-A powders
[CSIR-TRANS-1747] N84-32527
RF sputtered silicon and hafnium nitrides as applied to 440C steel
[NASA-TM-86662] N84-32536
Molten carbonate fuel cell performance model update
[DE84-012932] N84-32733
COAXIAL CABLES
Backfire bifilar helix antenna
[AD-D011118] N84-32719
COBALT ALLOYS
Stavutich high-cobalt WC-Co-matrix alloy
[CSIR-TRANS-1739] N84-32490
CODING
Improvements in the accuracy and stability of algorithms for the small-disturbance and full-potential equations applied to transonic flows
[NASA-TM-85970] N84-32350
Computer studies of hybrid-slotted working sections with minimum interference at subsonic speeds
[NASA-TM-86002] N84-32379
The compression of digital imagery by transformation
[INPE-2693-PRE/412] N84-33073
Prolonging the life of software
[DE84-001722] N84-33088
COEFFICIENT OF FRICTION
Mechanical interactions of rough surfaces
[DE84-014097] N84-32841
COHERENT ELECTROMAGNETIC RADIATION
Plasma dynamics N84-33354
COHERENT RADIATION
Eye safe laser transmitter
[AD-D011145] N84-32779
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160
COLD CATHODE TUBES
Breakdown processes in large-area cold-cathode vacuum triodes
[DE84-014026] N84-32817
COLD HARDENING
Influence of microalloying with titanium and boron on cold resistance of structural steel
[BLL-M-35698-(5828.4)] N84-32483
COLD PLASMAS
Low temperature epitaxial deposition of silicon by plasma enhanced CVD (Chemical Vapor Deposition)
[AD-A143208] N84-33216
COLD WORKING
Microstructural development and control in liquid phase sintering; processing, structures and properties of cold worked metal matrix composites
[AD-A143188] N84-32509
COLLIMATORS
Eye safe laser transmitter
[AD-D011145] N84-32779
COLLISIONAL PLASMAS
Influence of magnetic shear on the collisional current driven ion cyclotron instability
[AD-A143391] N84-33191
COLOR CODING
Development of color criteria for advanced displays
[AD-A143246] N84-33006
COMBUSTIBLE FLOW
Fuel injection device and method
[DE84-014320] N84-32846
COMBUSTION
A system for controlling the oxygen content of a gas produced by combustion
[NASA-CASE-LAR-13257-1] N84-32447
Conditional velocity statistics in premixed CH-4-air and C-2H-4-air turbulent flames
[DE84-012257] N84-32464
COMBUSTION CHAMBERS
A study of heat release rate distribution in a gas turbine combustor by acoustic measurements N84-32385
A theoretical and experimental study of turbulent evaporating sprays
[NASA-CR-174760] N84-32390
Rocket injector anomalies study. Volume 1: Description of the mathematical model and solution procedure
[NASA-CR-174702] N84-32428
Rocket injector anomalies study. Volume 2: Results of parametric studies
[NASA-CR-174703] N84-32429
Low cost thermal protection system processing
[AD-D011142] N84-32434
A system for controlling the oxygen content of a gas produced by combustion
[NASA-CASE-LAR-13257-1] N84-32447
Low heat loss laser combustion chamber
[AD-D011107] N84-32799
Hybrid seal
[AD-D011083] N84-32835
COMBUSTION EFFICIENCY
Fuel injection device and method
[DE84-014320] N84-32846
COMBUSTION PRODUCTS
A research study of the assessment of escape impairment by irritant combustion gases in postcrash aircraft fires
[FAA-CT-84-16] N84-32366
A system for controlling the oxygen content of a gas produced by combustion
[NASA-CASE-LAR-13257-1] N84-32447
Expendable infrared source and method therefor
[AD-D011112] N84-32551
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
A comparative study in the animal of the toxicity of the combustion products of diverse materials N84-33015
COMBUSTION TEMPERATURE
Molecular beam mass spectrometer sampling of flash ignited combustion
[DE84-006771] N84-32459
COMMAND AND CONTROL
Sensor correlation and data fusion theory
[AD-A143587] N84-33133
COMMERCIAL AIRCRAFT
Minimum-fuel, 3-dimensional flightpath guidance of transfer jets
[NASA-TP-2326] N84-32394
COMMUNICATION CABLES
Soldering method for cable connectors
[AD-D011103] N84-32718

COMMUNICATION EQUIPMENT
Computer-based transmission monitor and control system
[PB84-202068] N84-33069
COMMUNICATION NETWORKS
Video noise reduction
[SBC-RD-1984/7] N84-32615
IBM's token-ring LAN (Local-Area Network): A base-level communications solution
[AD-A143446] N84-33063
Computer-based transmission monitor and control system
[PB84-202068] N84-33069
RLE Progress Report no. 126
[RLE-PR-126] N84-33336
Communication networks N84-33356
COMMUNICATION SATELLITES
The 20 x 20 high speed microwave switches
[NASA-TM-83775] N84-32644
COMPILERS
S-1 software development and maintenance
[DE84-013071] N84-33091
COMPLEX VARIABLES
Annals of the Fourier Institute, volume 34, no. 1
[ISSN-0373-0956] N84-33025
Characterizations of zeros in the functions of some Nevanlinna type classes in the bidisk N84-33029
The Levi problem for cohomology classes N84-33032
The growth of plurisubharmonic functions in infinite domain N84-33033
Annals of the Fourier Institute, volume 34, no. 2
[ISSN-0373-0956] N84-33038
COMPLEXITY
Experimental and modal transport and diffusion studies in complex terrain with emphasis on tracer studies
[DE84-013076] N84-32975
COMPOSITE MATERIALS
Statistics of fracture of composite materials under multiaxial loading N84-32433
A simple rectangular element for 2-dimensional analysis of laminated composites
[NASA-TM-86291] N84-32439
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
COMPOSITE STRUCTURES
Design of a composite wing extension for a general aviation aircraft
[NASA-CR-173832] N84-32377
COMPRESSIBLE FLOW
Three-dimensional, time-dependent, compressible, turbulent, integral boundary layer equations in general curvilinear coordinates and their numerical solutions N84-32346
COMPRESSION LOADS
Hole interaction and load introduction effects for compression-loaded laminates with holes
[NASA-TM-86287] N84-32435
Distribution of micro-heterogeneous deformation in O6Yu steel around inclusions during compression
[BLL-M-35641-(5828.4)] N84-32498
Opening of an interface flaw in a layered elastic half-plane under compressive loading
[NASA-TM-86282] N84-32877
COMPRESSION WAVES
Petrography and ultrasonic wave velocity in the Admire Formation (Permian), Kansas N84-32945
COMPRESSIVE STRENGTH
Simple examples of non linear truss behavior
[AD-A143368] N84-32882
COMPRESSOR BLADES
Analysis of three-dimensional transonic compressors
[NASA-CR-166580] N84-32356
Pin rooted blade biaxial air seal
[AD-D011086] N84-32391
Report of tests of a compressor configuration of CD (Controlled Diffusion) blading
[AD-A143499] N84-32832
COMPRESSOR ROTORS
Investigation of the three-dimensional flow field within a transonic fan rotor: Experiment and analysis
[NASA-TM-83739] N84-32357
COMPRESSORS
High-power RF compressor
[DE84-013116] N84-32664
Report of tests of a compressor configuration of CD (Controlled Diffusion) blading
[AD-A143499] N84-32832
COMPUTATION
Analysis of parametrically excited large vibration systems
[AD-A143263] N84-32879
Summary of research in applied mathematics, numerical analysis and computer science at the Institute for Computer Applications in Science and Engineering
[NASA-CR-172421] N84-33024
Research in computer science
[NASA-CR-173857] N84-33056
MECA: A supercomputer for Monte Carlo
[DE84-014129] N84-33066
Quasiconformal mappings and grid generation
[NASA-CR-173920] N84-33105
On accuracy conditions for the numerical computation of waves
[NASA-CR-172433] N84-33111
Some masses for population 1 and 2 cepheids
[DE84-014032] N84-33311
COMPUTATIONAL FLUID DYNAMICS
Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351
Analysis of three-dimensional transonic compressors
[NASA-CR-166580] N84-32356
Computational fluid dynamics at the ICMA (Institute of Computational Mathematics and Applications)
[AD-A143510] N84-32759
Second- and third-order upwind difference schemes for hyperbolic conservation laws
[NASA-TM-85959] N84-33108
COMPUTATIONAL GRIDS
Aerodynamic heating computations for projectiles. Volume 3: BRL interactive plotting program (BRLINPLOT)
[AD-A143254] N84-32361
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83785] N84-32789
Numerical diffraction by a uniform grid
[DE84-012861] N84-33121
COMPUTER AIDED DESIGN
Conceptual design of a noncontacting power transfer device for the ASPS Vernier system
[NASA-CR-172238] N84-32677
Computer aided modeling and post processing with NASTRAN analysis N84-32869
Graphical error analysis
[BMFT-FB-T-84-081] N84-33093
Feedback systems and simultaneous design
[AD-A143547] N84-33102
Custom integrated circuits N84-33361
COMPUTER AIDED MANUFACTURING
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1
[AD-A143248] N84-32830
COMPUTER AIDED MAPPING
Tropospheric delay effects in radio interferometry N84-32636
COMPUTER DESIGN
Design, test, and evaluation of an Air Force environmental model and data exchange
[AD-A143226] N84-33060
MECA: A supercomputer for Monte Carlo
[DE84-014129] N84-33066
COMPUTER GRAPHICS
A mathematical simulation model of the CH-46B helicopter, volume 2
[NASA-TM-84351] N84-32380
Optional stopping performance under graphic and numeric CRT formatting
[AD-A143274] N84-32712
Flight systems raster graphics software reference manual
[ARL-SYS-TM-72] N84-33072
Basic geometric algorithms for use with graphic input
[DE84-013256] N84-33090
Graphical error analysis
[BMFT-FB-T-84-081] N84-33093
A study of methods to predict and measure the transmission of sound through the walls of light aircraft. A survey of techniques for visualization of noise fields
[NASA-CR-173917] N84-33146
NATURAL graphics N84-33274
Cognitive information processing N84-33360
COMPUTER NETWORKS
Array processor utilization in the computation of real-time images
[ARL-SYS-TM-73] N84-33058
On the impact of communication complexity in the design of parallel numerical algorithms
[NASA-CR-172436] N84-33059
Higher layer protocols for a workstation architecture
[DE84-013649] N84-33087
Simulation of large networks of processors by smaller ones
[AD-A143529] N84-33098
The allocation of data and programs in distributed data processing environments N84-33261
A methodology for the distribution of databases N84-33265
Asynchronous file transfer to IBM PC's N84-33275
Data communication between data terminal equipment and the JPL administrative data base management system N84-33278
LaRC local area networks to support distributed computing N84-33281
Adaptive subject description in document retrieval N84-33298
Optical propagation and communication N84-33355
COMPUTER PROGRAMMING
INTERMD: A computer program to predict intermodulation product generation on two-way FM radio frequencies
[DE84-013767] N84-32661
Programmable signal processing device
[AD-D011109] N84-32673
Summary of research performed at MIT Laboratory for Computer Science
[AD-A143459] N84-33064
Research on output feedback control of systems with ill-conditioned dynamics
[NASA-CR-173921] N84-33071
ADA (trademark) training curriculum. Programming methodology m203 teacher's guide
[AD-A143581] N84-33082
ADA (trademark) training curriculum. Basic ADA programming l202 teacher's guide, volume 1
[AD-A143584] N84-33083
ADA (trademark) training curriculum. Basic ADA programming l202 teacher's guide, volume 2
[AD-A143585] N84-33084
Solving low density knapsacks
[DE84-006964] N84-33085
Prolonging the life of software
[DE84-001722] N84-33088
S-1 software development and maintenance
[DE84-013071] N84-33091
Programmer productivity aid catalog
[PB84-212166] N84-33095
Analytical soluation for computing first and second order ordinary differential equations using a method of series development
[INPE-2980-PRE/442] N84-33110
Strip and load data N84-33273
NATURAL graphics N84-33274
COMPUTER PROGRAMS
Investigation of the external flow analysis for density measurements at high altitude — shuttle upper atmosphere mass spectrometer experiment
[NASA-CR-173881] N84-32352
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85980] N84-32358
Aerodynamic heating computations for projectiles. Volume 1: In-depth heat conduction modifications to the ABRES shape change code (BRLASCC)
[AD-A143252] N84-32359
Aerodynamic heating computations for projectiles. Volume 3: BRL interactive plotting program (BRLINPLOT)
[AD-A143254] N84-32361
Validation of an Active Gear, Flexible Aircraft Take-off and Landing analysis (AGFATL)
[NASA-TP-2353] N84-32378
Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine
[NASA-TP-2309] N84-32388
Software conversion history of the Flight Dynamics System (FDS)
[NASA-CR-175257] N84-32404
GCKP84-general chemical kinetics code for gas-phase flow and batch processes including heat transfer effects
[NASA-TP-2320] N84-32446
Submillimeter, millimeter, and microwave spectral line catalogue
[NASA-CR-173899] N84-32448
Optimization of antenna structure design N84-32624
NASTRAN structural model for the large 64-meter antenna pedestal. Part 3: Applications to hydrostatic bearing oil film N84-32638
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650
HF prediction using adiabatic invariant theory
[AD-A143239] N84-32652
High frequency radar software reference manual for product one
[PB84-194885] N84-32665
High efficiency heat pump using ground heat source
[DE84-006385] N84-32761
Research in computer science
[NASA-CR-173857] N84-33056

Microcomputers in transportation: Software and source book
[PB84-195155] N84-33067
Search command for character strings and words in computer files on CMS (Conversational Monitor System)
[PB84-201243] N84-33068
Computer-based transmission monitor and control system
[PB84-202068] N84-33069
Research on output feedback control of systems with ill-conditioned dynamics
[NASA-CR-173921] N84-33071
Flight systems raster graphics software reference manual
[ARL-SYS-TM-72] N84-33072
ADA (trademark) training curriculum. Basic ADA programming I202 teacher's guide, volume 1
[AD-A143584] N84-33083
ADA (trademark) training curriculum. Basic ADA programming I202 teacher's guide, volume 2
[AD-A143585] N84-33084
Normal modes of the NCAR (National Center for Atmospheric Research) Community Forecast Model (CFM)
[PB84-191220] N84-33094
Theoretical issues in the design and verification of distributed systems N84-33096
Monte Carlo estimation under different distributions using the same simulation
[DE84-012438] N84-33136
A study of the extent of automation in small college libraries and relationships of attitudes of library directors toward it N84-33260
Effective organizational solutions for implementation of DBMS software packages N84-33268
Status tracking system for reports N84-33276

COMPUTER SYSTEMS DESIGN
The Record of Electrical and Communication Engineering Conversazione, volume 53, no. 1, Jul. 1984
[ISSN-0385-7719] N84-32565
An automatic syntheses of hardware algorithm N84-32568
The design and usage of the new data management features in NASTRAN N84-32666
The design and performance of a parallel computer architecture for simulation N84-33054
S-1 software development and maintenance
[DE84-013071] N84-33091
Langley experience with ADABAS/NATURAL N84-33272
Strip and load data N84-33273

COMPUTER SYSTEMS PERFORMANCE
Strategies of design, development and activation of the Nova control system
[DE84-013075] N84-32601
COSMIC/NASTRAN on the Cray computer systems N84-32668
Langley experience with ADABAS/NATURAL N84-33272

COMPUTER SYSTEMS PROGRAMS
Performance simulation for unit-memory convolutional codes with byte-oriented Viterbi decoding algorithm N84-32630
LANDSAT-4 image data quality analysis — LANDSAT 5 imagery
[E84-10173] N84-32893
S-1 software development and maintenance
[DE84-013071] N84-33091

COMPUTER TECHNIQUES
Flight Experiment Demonstration System (FEDS): Mathematical specification
[NASA-CR-175252] N84-32405
A finite element implementation of the dual variable method for the Navier-Stokes equations N84-32746
Strategies of design, development and activation of the Nova control system
[DE84-013075] N84-32601
Impact of robots and computers on the work force of the 1980's
[GPO-31-912] N84-32826
Twelfth NASTRAN Users' Colloquium
[NASA-CP-2328] N84-32864
Manual and automated line generalization and feature displacement
[AD-A143250] N84-32900
Computer calculated analysis of subsurface formation porosities in central New York state N84-32941
Summary of research in applied mathematics, numerical analysis and computer science at the Institute for Computer Applications in Science and Engineering
[NASA-CR-172421] N84-33024
Summary of research performed at MIT Laboratory for Computer Science
[AD-A143459] N84-33064
The use of pipeline techniques in the architecture of digital processors employed in real time applications
[INPE-2992-TDL/153] N84-33075
Computer vision for real-time orbital operations. Center directors discretionary fund
[NASA-TM-86457] N84-33076
High-level operations in nonprocedural programming languages
[AD-A143470] N84-33078
West Europe report: Science and technology
[JPRS-WST-84-030] N84-33141
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183

COMPUTER VISION
Computer vision for real-time orbital operations. Center directors discretionary fund
[NASA-TM-86457] N84-33076

COMPUTERIZED SIMULATION
Performance simulation for unit-memory convolutional codes with byte-oriented Viterbi decoding algorithm N84-32630
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650
HF prediction using adiabatic invariant theory
[AD-A143239] N84-32652
A 1-dimensional disk model simulation for klystron design
[DE84-013793] N84-32727
The design and performance of a parallel computer architecture for simulation N84-33054
Monte Carlo estimation under different distributions using the same simulation
[DE84-012438] N84-33136
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183
Computer simulation of the heavy-duty turbo-compounded diesel cycle for studies of engine efficiency and performance
[NASA-CR-174755] N84-33306

COMPUTERS
Research in computer science
[NASA-CR-173857] N84-33056

CONCENTRATORS
Concentrating photovoltaic technology
[DE84-012275] N84-32931

CONCRETE STRUCTURES
Time-to-corrosion of reinforcing steel in concrete slabs. Volume 5: Calcium nitrite admixture or epoxy-coated reinforcing bars as corrosion protection systems
[PB84-195239] N84-32578
Investigation and rehabilitation to extend service life of DSS-13 antenna concrete foundation N84-32637

CONCRETES
Modeling of concrete response at high temperature
[DE84-009587] N84-32570

CONCURRENT PROCESSING
Concurrency control using locks in distributed databases N84-33262

CONDENSING
Two-dimensional finite amplitude mountain waves in the presence of moisture N84-32947
Phase transitions in chemisorbed systems N84-33342

CONDUCTION ELECTRONS
Formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules
[AD-A143552] N84-33226

CONDUCTIVE HEAT TRANSFER
Aerodynamic heating computations for projectiles. Volume 1: In-depth heat conduction modifications to the ABRES shape change code (BRLASCC)
[AD-A143252] N84-32359
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC)
[AD-A143253] N84-32360
Development of advanced thermal insulation for appliances
[DE84-013132] N84-32763

CONFERENCES
Technical evaluation report on the Fluid Dynamics Panel Symposium on Wind Tunnels and Testing Techniques
[AGARD-AR-193] N84-32402
Twelfth NASTRAN Users' Colloquium
[NASA-CP-2328] N84-32864
Proceedings of the Solar Thermal-Photochemical Conversion Workshop
[DE84-000089] N84-32929
Proceedings of a Workshop on Polar Stratospheric Clouds: Their Role in Atmospheric Processes
[NASA-CP-2318] N84-32952
Global Observations and Understanding of the General Circulation of the Oceans
[NASA-CR-173905] N84-32986
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
NASA Administrative Data Base Management Systems, 1984
[NASA-CP-2323] N84-33266

CONFIDENCE LIMITS
One-sided r-reliable intervals and their associated confidences on the sum of two Continuous/Independent, random variables
[AD-A143387] N84-33131

CONFORMAL MAPPING
Conformal mapping and almost Lipschitzian curves N84-33040
Quasiconformal mappings and grid generation
[NASA-CR-173920] N84-33105

CONGRESSIONAL REPORTS
Impact of robots and computers on the work force of the 1980's
[GPO-31-912] N84-32826
Agriculture and water use: Present and future issues
[GPO-30-509] N84-32897
National environmental monitoring
[GPO-28-186] N84-32933
Agriculture weather services
[GPO-27-913] N84-32966
Hurricane Alicia: Prediction, damage and recovery efforts
[GPO-33-446] N84-32968
The 1985 NASA authorization, volume 2
[GPO-34-202] N84-33301
Oversight on the Federal Aviation Administration fiscal year 1985 research, engineering and development budget request
[GPO-34-924] N84-33302
National Aeronautics and Space Administration Authorization Act, 1985
[PUB-LAW-98-361] N84-33303

CONICAL FLOW
Supersonic flows around a circular cone with or without blowing on the surface
[AD-A143258] N84-32362

CONICAL NOZZLES
Static thrust augmentation of rocket motors by air entrainment
[AD-A143179] N84-32430

CONNECTORS
Optical fiber termination and splicing techniques
[DE84-013919] N84-32572
Soldering method for cable connectors
[AD-D011103] N84-32718
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32875

CONSERVATION LAWS
Least-squares smoothing of direct-exchange in zonal analysis
[DE84-002612] N84-32770
Second- and third-order upwind difference schemes for hyperbolic conservation laws
[NASA-TM-85959] N84-33106

CONSOLIDATION
Processing and consolidation of rapidly solidified alloys: A technology assessment
[DE84-014673] N84-32523

CONSUMERS
Legislation needed to clarify future of consumer protection and federal preemption after the Civil Aeronautics Board sunsets
[PB84-210103] N84-32371

CONSUMPTION
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005

CONTAINERLESS MELTS
Containerless high purity pulling process and apparatus for glass fibers
[NASA-CASE-MFS-25905-2] N84-32569

CONTAMINATION
Flexible, resilient anti-contamination baffle
[AD-D011111] N84-32421

CONTINUOUS RADIATION
Universal control grid modulator
[AD-D011108] N84-32672
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007

CONTINUOUS WAVE LASERS
Transverse flow CW atomic iodine laser system
[AD-D011098] N84-32610
CW HF R-branch laser
[AD-D011120] N84-32613

CONTOURS
Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine
[NASA-TP-2309] N84-32388

Microwave terrestrial link rain attenuation prediction parameter analysis
[PB84-207984] N84-32666

CONTROL
Static methods in the design of nonlinear automatic control systems
[AD-A143297] N84-33101

CONTROL EQUIPMENT
Strategies of design, development and activation of the Nova control system
[DE84-013075] N84-32801
Computer-based transmission monitor and control system
[PB84-203068] N84-33069

CONTROL THEORY
Linearized dynamical model for the NASA/IEEE SCOLE configuration
[NASA-CR-172394] N84-32423
Controller technique of compensation figured in an active control scheme on the accumulated effects of deviation in the modeling
[INPE-2987-TDL/152] N84-33100
Frequency response design methods for large scale systems
[DE84-013111] N84-33103
Concurrency control using locks in distributed databases N84-33262

CONTROL UNITS (COMPUTERS)
Battery Computer System (BCS) human factors field evaluation
[AD-A143425] N84-33062

CONTROLLED SYSTEMS DESIGN
Feedback systems and simultaneous design
[AD-A143547] N84-33102

CONTROLLERS
Engineering changes to the 0.1m cryogenic wind tunnel at Southampton University
[NASA-CR-172430] N84-32397
The 64-m antenna automatic subreflector focusing controller N84-32628
High temperature electronics technology
[AD-A143571] N84-32714
Variable gain oven temperature control circuit
[AD-D011141] N84-32778
Optical power source control system
[AD-D011124] N84-33175

CONVECTION
Natural convection in porous media: An experimental and numerical study for vertical annular and rectangular enclosures N84-32744
Diffusion modeling with convective scaling and effects of surface inhomogeneities
[PB84-210053] N84-32981
Period-doubling 2-torus state in a convecting He-3-superfluid He-4 solution
[DE84-009695] N84-33243
Onset of oscillations in symmetric convective states in a superfluid He-3-He-4 mixture
[DE84-009694] N84-33244

CONVECTIVE HEAT TRANSFER
Temperature controlled gyro
[AD-D011138] N84-32777

CONVERGENCE
Kolmogorov's and Mourier's strong laws for arrays with independent and identically distributed columns
[AD-A143222] N84-33139

CONVERGENT-DIVERGENT NOZZLES
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 1: Test nozzles and acoustic data
[NASA-CR-168234-VOL-1] N84-33148
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 3: Shadowgraph photos and facility description
[NASA-CR-168234-VOL-3] N84-33150

COOLANTS
Sloshing response of a reactor tank with internals
[DE84-009629] N84-32766

COOLING SYSTEMS
Laser utilizing a gaseous lasing medium and method for operating the same
[DE84-014500] N84-32819

COORDINATES
Evaluation of the limiting accuracy in determining the coordinates of a point light source by a television tracking system using an image dissector with the presence of a nonstationary current component N84-32613
Quasiconformal mappings and grid generation
[NASA-CR-173920] N84-33105

COPPER
Supersonic metal cluster beams
[DE84-012976] N84-32516
Radial distribution function as an analysis technique
[DE84-013242] N84-33235

COPPER CHLORIDES
Solid state tetrachloroaluminate storage battery having a transition metal chloride cathode
[AD-D011133] N84-32924

CORRELATION
Correlational estimation of parameters of solid state microwave devices N84-32609
Frequency correlation of HF skywave ground backscatter Doppler spectra
[PB84-204353] N84-32668

CORRELATORS
Photon correlation spectroscopy and applications N84-33352

CORROSION
On-site measurement of the speed of corrosion of a metal in water
[BLL-T6310/BG/WH770/84] N84-32488
Ferrous alloy metallurgy, liquid lithium corrosion and welding
[DE84-014656] N84-32517

CORROSION PREVENTION
A study of Beta-hydroxyamines and Beta-hydroxysulphides as corrosion inhibitors for metals
[BLL-T6313/BG/WH773/84] N84-32487

CORROSION RESISTANCE
Ampule tests to simulate glass corrosion in ambient temperature lithium batteries, volume 2
[DE84-014330] N84-32732
Effect of surface doping on the oxidation of chromia former alloys
[DE84-013390] N84-33247

CORROSION TESTS
Time-to-corrosion of reinforcing steel in concrete slabs. Volume 5: Calcium nitrite admixture or epoxy-coated reinforcing bars as corrosion protection systems
[PB84-195239] N84-32578

COSMIC RAYS
High energy physics research at Texas Agriculture and Mining University — magnetic monopoles in cosmic rays and hadron calorimeter design
[DE84-011616] N84-33167
Model for GCR-particle fluxes in stony meteorites and production rates of cosmogenic nuclides
[NASA-CR-173923] N84-33321
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201508] N84-33329
Possible cosmological origin of the ultra high energy cosmic rays
[DE84-013083] N84-33334

COSMOCHEMISTRY
Model for GCR-particle fluxes in stony meteorites and production rates of cosmogenic nuclides
[NASA-CR-173923] N84-33321

COSMOLOGY
Axions, neutrinos and strings: The formation of structure in an SO(10) universe
[NASA-TM-86139] N84-33317
Possible cosmological origin of the ultra high energy cosmic rays
[DE84-013083] N84-33334

COST ANALYSIS
Artificial Intelligence-Robotics applications to Navy aircraft maintenance
[AD-A143219] N84-32345
Energy efficient engine component development and integration program
[NASA-CR-173684] N84-32389
Fuel cell power systems for Navy applications
[AD-A143402] N84-32923
Analysis of benefits realized from multiyear contracting for the Black Hawk helicopter
[AD-A143485] N84-33254
New techniques for adjusting reference factors
[DE84-012649] N84-33300

COST EFFECTIVENESS
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations
[NASA-CR-173918] N84-32683

COST ESTIMATES
Source circuit design considerations N84-32690
New techniques for adjusting reference factors
[DE84-012649] N84-33300

COUPLING
Beam cavity coupling impedance
[DE84-014064] N84-32662

COVARIANCE
Uncertainty covariances in robotics applications
[DE84-013417] N84-32643

CRACK INITIATION
Weldability of steels: Study of cracking and methods of examination
[BLL-RISLEY-TRANS-4519-(9091.9)] N84-32475
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue
[NASA-CR-174666] N84-32503

CRACK PROPAGATION
Weldability of steels: Study of cracking and methods of examination
[BLL-RISLEY-TRANS-4519-(9091.9)] N84-32475
Theoretical research program to predict the properties of molecules and clusters containing transition metal atoms
[NASA-CR-173924] N84-32502
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue
[NASA-CR-174666] N84-32503
Modeling of concrete response at high temperature
[DE84-009587] N84-32570
On the mechanics of fatigue crack growth due to contact loading N84-32659
Retardation analytical model to extend service life
[NASA-CR-173891] N84-32662
Crack problems for bonded nonhomogeneous materials under antiplane shear loading
[NASA-CR-173892] N84-32663
Opening of an interface flaw in a layered elastic half-plane under compressive loading
[NASA-TM-86282] N84-32677
Analysis of dynamic mixed-mode crack tip stress patterns
[AD-A143329] N84-32680
Thermal shock: High temperature high energy rate testing
[DE84-014147] N84-32686
Systematic jointing in the cardium sandstone along the Bow River, Alberta, Canada N84-32937

CRACK TIPS
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue
[NASA-CR-174666] N84-32503
Analysis of dynamic mixed-mode crack tip stress patterns
[AD-A143329] N84-32680

CRACKING (FRACTURING)
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner
[NASA-CR-174691] N84-32504

CRACKS
Opening of an interface flaw in a layered elastic half-plane under compressive loading
[NASA-TM-86282] N84-32677

CRASHES
A research study of the assessment of escape impairment by irritant combustion gases in postcrash aircraft fires
[FAA-CT-84-16] N84-32366

CRASHWORTHINESS
Development of 2 underseat energy absorbers for application to crashworthy passenger seats for general aviation aircraft
[NASA-CR-158927] N84-32367

CRAY COMPUTERS
COSMIC/NASTRAN on the Cray computer systems N84-32668

CREEP ANALYSIS
Creep transitions in aluminum solid-solution alloys N84-32472

CREEP PROPERTIES
Probabilistic models of the stress-rupture of composite materials: Summary
[DE84-013477] N84-32441
Modeling of concrete response at high temperature
[DE84-009587] N84-32570
Computer system for fiber creep testing
[DE84-014453] N84-32685

CRITICAL TEMPERATURE
The proximity effects of superconducting multilayer film
[AD-A143255] N84-33217

CROSSBEDDING (GEOLOGY)
Systematic jointing in the cardium sandstone along the Bow River, Alberta, Canada N84-32937

CROSSLINKING
Properties of UV-cured polyurethane acrylates: Effect of polyol type and molecular weight
[AD-A143176] N84-32537

CRYOGENIC COOLING
Maximum supercooling in liquid 3He-4He mixtures near the tricritical point
[DE84-010076] N84-33232
Dynamical scaling in 3He-4He liquid mixtures
[DE84-010072] N84-33233

CRYOGENIC WIND TUNNELS
Engineering changes to the 0.1m cryogenic wind tunnel at Southampton University
[NASA-CR-172430] N84-32397

Technical evaluation report on the Fluid Dynamics Panel Symposium on Wind Tunnels and Testing Techniques [AGARD-AR-193] N84-32402

CRYPTOGRAPHY
Solving low density knapsacks [DE84-006964] N84-33085

CRYSTAL DEFECTS
Defect clusters and electrical properties in transition metal monoxides [DE84-014851] N84-33242

CRYSTAL GROWTH
Cubic silicon nitride in iron-silicon steels [BLL-M-35653-(5828.4)] N84-32486
Containerless high purity pulling process and apparatus for glass fibers [NASA-CASE-MFS-25905-2] N84-32569
The octahedron-rhombododecahedron morphological series of synthetic diamond crystals [CSIR-TRANS-1746] N84-33205
EPR investigation of inclusions in cubic boron nitride crystals [CSIR-TRANS-1752] N84-33207
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors [INPE-3045-TDL/157] N84-33212
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films [DE84-013122] N84-33246

CRYSTAL LATTICES
Effect of formation conditions and contact zone structure on adhesion strength of carbide forming metal coatings on diamond [CSIR-TRANS-1735] N84-32492
Inelastic strong interactions at high energies [DE84-013647] N84-33170

CRYSTAL OSCILLATORS
Research in monolithic, signal-processing circuits [AD-A143204] N84-32709

CRYSTAL STRUCTURE
Effect of formation conditions and contact zone structure on adhesion strength of carbide forming metal coatings on diamond [CSIR-TRANS-1735] N84-32492
Method to reveal microstructures in single phase alloys [AD-D011094] N84-32512
Structure of polycrystalline boron nitride as determined by electron microscopic thin sections [CSIR-TRANS-1738] N84-32533
Characterization of erosion of metallic materials under cavitation attack in a mineral oil [NASA-TP-2368] N84-32625
Inelastic strong interactions at high energies [DE84-013647] N84-33170
The octahedron-rhombododecahedron morphological series of synthetic diamond crystals [CSIR-TRANS-1746] N84-33205
EPR investigation of inclusions in cubic boron nitride crystals [CSIR-TRANS-1752] N84-33207
New materials from high temperature synthesis [DE84-014125] N84-33231
Diamond surface: Atomic and electronic structure [DE84-013518] N84-33234
X-ray diffuse scattering N84-33341

CRYSTALLINITY
Crystalline rocks of the Northeastern United States [DE84-013673] N84-32962

CRYSTALLIZATION
Epitaxial crystallization in the Te-HgTe-CdTe system [CSIR-TRANS-1745] N84-33206

CRYSTALLOGRAPHY
Numerical calculations of the function of the static receptivity of electrons in metals [BLL-M-35640-(5828.4)] N84-32480
Structure of polycrystalline boron nitride as determined by electron microscopic thin sections [CSIR-TRANS-1738] N84-32533
The octahedron-rhombododecahedron morphological series of synthetic diamond crystals [CSIR-TRANS-1746] N84-33205

CRYSTALS
Role of grain size on the brittle to ductile transition of the strongly ordered alloy Ni3Al [DE84-014904] N84-32519
Optical and electrical properties of organic dye crystals [DE84-014930] N84-33240

CURING
Low cost thermal protection system processing [AD-D011142] N84-32434
Properties of UV-cured polyurethane acrylates: Effect of polyol type and molecular weight [AD-A143176] N84-32537
Properties of UV-curable polyurethane acrylates: Effect of reactive diluent [AD-A143241] N84-32540
Cure reactions, network structure and mechanical response of diaminodiphenyl sulfone cured tetraglycidyl 4,4'diaminodiphenyl methane [DE84-012607] N84-32548

CURRENT DISTRIBUTION
Thermoscopic study of diffraction current distribution N84-32583

CURVATURE
Developing turbulent flow in strongly curved passages of square and circular cross-section [AD-A143279] N84-32755

CURVE FITTING
The prediction of acoustical particle motion using an efficient polynomial curve fit procedure [NASA-CR-173915] N84-33145
The effect of dimensionality on solar spectrum curves [DE84-014136] N84-33327

CURVES (GEOMETRY)
Conformal mapping and almost Lipschitzian curves N84-33040

CYCLONES
Climate prediction. Part 1: Cyclone frequency [AD-A143576] N84-32973
Mariners Weather Log, Volume 28, Number 2, April-May-June 1984 [PB84-204569] N84-32978

CYCLOTRON RESONANCE
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946
Influence of magnetic shear on the collisional current driven ion cyclotron instability [AD-A143391] N84-33191

CYLINDERS
Engine wear with methanol fuel in a nitrogen-free environment [AD-A143530] N84-32833
Detection of damage in hydraulic components by acoustic emission techniques [AD-A143262] N84-32850

CYLINDRICAL ANTENNAS
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket [AD-A143266] N84-32853

CYLINDRICAL BODIES
Low cost thermal protection system processing [AD-D011142] N84-32434
Beam recombination via cylindrical mirror [AD-D011104] N84-32812
French firm uses unique flexible workshop with laser cutter N84-33143
Application of stiffened cylinder analysis to ATP interior noise studies [NASA-CR-172384] N84-33147

D

DAMAGE
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket [AD-A143266] N84-32853
Detection of damage in hydraulic components by acoustic emission techniques [AD-A143262] N84-32850

DATA ACQUISITION
The feasibility, practicality and utility of P-3 inflight refueling [AD-A143419] N84-32382
Telecommunications and data acquisition support for the Pioneer Venus Project: Pioners 12 and 13, prelaunch through March 1984 [NASA-CR-173893] N84-32403
Remote data acquisition system [AD-A143347] N84-32419
Design of a digital telemetry data collection system [DE84-013916] N84-32420
The Telecommunications and Data Acquisition Report [NASA-CR-173885] N84-32622
Availability of the DSN telemetry data system and its major elements, including the TWM assemblies N84-32639
A study of DSN traveling wave maser system reliability N84-32640
GCF compatibility with packets and data compression N84-32641
Mojave base station implementation N84-32643
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 1: Executive summary [NASA-CR-175261] N84-32646

DATA BASE MANAGEMENT SYSTEMS
Summary of research performed at MIT Laboratory for Computer Science [AD-A143459] N84-33084
An online directory of databases for material properties [DE84-013210] N84-33099
A methodology for the distribution of databases N84-33265
NASA Administrative Data Base Management Systems, 1984 [NASA-CP-2323] N84-33266
Strategies for converting to a DBMS environment N84-33267
Effective organizational solutions for implementation of DBMS software packages N84-33268
The administrative window into the integrated DBMS N84-33270
Langley experience with ADABAS/NATURAL N84-33272
Strip and load data N84-33273
NATURAL graphics N84-33274
Asynchronous file transfer to IBM PC's N84-33275
The NBS data management technology program N84-33277
Data communication between data terminal equipment and the JPL administrative data base management system N84-33278
An exploratory analysis of the relationship between media richness and managerial information processing [AD-A143503] N84-33293

DATA BASES
Artificial Intelligence-Robotics applications to Navy aircraft maintenance [AD-A143219] N84-32345
Pilot study and evaluation of a SMMR-derived sea ice data base [NASA-CR-175255] N84-32896
An online directory of databases for material properties [DE84-013210] N84-33099
Concurrency control using locks in distributed databases N84-33262
Deduction in nonhorn databases N84-33263
Scientific and technical information transfer: Issues and options [RAND/N-2131-NSF] N84-33286
Physics in Europe: A data file of selected research [AD-A143428] N84-33289
An evaluation of two reliability and maintainability information systems [AD-A143438] N84-33290
Notes for medical catalogers, 1983 [PB84-195674] N84-33296

DATA COLLECTION PLATFORMS
DCP systems and characteristics [INPE-2948-PRE/431] N84-32899

DATA COMPRESSION
GCF compatibility with packets and data compression N84-32641

DATA CONVERSION ROUTINES
Software conversion history of the Flight Dynamics System (FDS) [NASA-CR-175257] N84-32404

DATA CORRELATION
Heat-of-mixing experiments for liquefied gases [PB84-215094] N84-32560
Time-to-corrosion of reinforcing steel in concrete slabs. Volume 5: Calcium nitrite admixture or epoxy-coated reinforcing bars as corrosion protection systems [PB84-195239] N84-32578
Interrelation between parameters of M-type traveling wave tube N84-32598
Mapping magnetized geologic structures from space: The effect of orbital and body parameters [E84-10191] N84-32895
Hydrographic measurements in the western Arlboran Sea, October 1982 [AD-A143588] N84-32985
Controller technique of compensation figured in an active control scheme on the accumulated effects of deviation in the modeling [INPE-2997-TDL/152] N84-33100

DATA LINKS
On applications of a specification and description language NESDEL to communication protocols N84-32567
Electronic Switching Spherical Array (ESSA) antenna systems [NASA-TM-86127] N84-32621

DATA MANAGEMENT
The design and usage of the new data management features in NASTRAN N84-32866
Asynchronous file transfer to IBM PC's N84-33275
Status tracking system for reports N84-33276

The NBS data management technology program N84-33277
Data communication between data terminal equipment and the JPL administrative data base management system N84-33278
NASA metrology information system: A NEMS subsystem N84-33279
Langley's views on NEMS N84-33280
LaRC local area networks to support distributed computing N84-33281
Implementing automated information systems in the Air Force [AD-A143366] N84-33288
Solar-terrestrial data access distribution and archiving [NASA-CR-173906] N84-33295

DATA PROCESSING
A strategy for successful deep space information transmission in bad weather N84-32635
A simulation of remote sensor systems and data processing algorithms for spectral feature classification [NASA-CR-172393] N84-32764
I/O channel interface [NBS-FIPS-PUB-60-2] N84-33057
IBM's token-ring LAN (Local-Area Network): A base-level communications solution [AD-A143446] N84-33063
Prolonging the life of software [DE84-001722] N84-33088
Algorithms for error localization of discrete data [DE84-014417] N84-33089
The allocation of data and programs in distributed data processing environments N84-33261
An exploratory analysis of the relationship between media richness and managerial information processing [AD-A143503] N84-33293

DATA PROCESSING EQUIPMENT
Flight Experiment Demonstration System (FEDS): Mathematical specification [NASA-CR-175252] N84-32405

DATA PROCESSING TERMINALS
Data communication between data terminal equipment and the JPL administrative data base management system N84-33278

DATA RETRIEVAL
Adaptive subject description in document retrieval N84-33296

DATA SAMPLING
Coherent digital demodulation of a residual carrier signal using IF sampling N84-32634

DATA TRANSMISSION
A strategy for successful deep space information transmission in bad weather N84-32635
GCF compatibility with packets and data compression N84-32641
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 1: Executive summary [NASA-CR-175261] N84-32646
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 2: Design and development [NASA-CR-175262] N84-32647
Higher layer protocols for a workstation architecture [DE84-013649] N84-33087
Asynchronous file transfer to IBM PC's N84-33275
LaRC local area networks to support distributed computing N84-33281

DEACTIVATION
Deactivation of thionyl chloride cells [AD-D011113] N84-32908

DECELERATION
An investigation of a new flight test method for measuring the performance of general aviation aircraft N84-32375

DECISION MAKING
Optional stopping performance under graphic and numeric CRT formatting [AD-A143274] N84-32712
Visual perception in systems management in aeronautics N84-33017
Assessment of trends of input actions of inertial objects [BLL-M-35689-(5828.4)] N84-33104
Effective organizational solutions for implementation of DBMS software packages N84-33266
An evaluation of two reliability and maintainability information systems [AD-A143438] N84-33290
An exploratory analysis of the relationship between media richness and managerial information processing [AD-A143503] N84-33293

DECODING
Performance simulation for unit-memory convolutional codes with byte-oriented Viterbi decoding algorithm N84-32630
Error-trellis syndrome decoding techniques for convolutional codes N84-32633

DECOMPOSITION
Kinetics and mechanisms of thermolytic interconversions of boron hydrides [AD-A143525] N84-32455

DEEP SPACE NETWORK
Telecommunications and data acquisition support for the Pioneer Venus Project: Pioners 12 and 13, prelaunch through March 1984 [NASA-CR-173693] N84-32403
The Telecommunications and Data Acquisition Report [NASA-CR-173885] N84-32622
Magnetic refrigeration development N84-32626
The 64-m antenna automatic subreflector focusing controller N84-32628
Intermodulation product levels in flame-sprayed materials N84-32629
Mojave base station implementation N84-32643

DEFECTS
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors [AD-A143551] N84-33225

DEFENSE PROGRAM
Matrix management in DoD: An annotated bibliography [AD-A143316] N84-33253
Source hierarchy list. Volume 1: A through H [AD-A143500] N84-33291
Source hierarchy list. Volume 2: I through Z [AD-A143501] N84-33292

DEFLECTION
A linear aerodynamic analysis for unsteady transonic cascades [NASA-CR-3833] N84-32355
Direct measurement of Earth's vertical deflection using global positioning system [AD-D011099] N84-32373

DEFOCUSING
The 64-m antenna automatic subreflector focusing controller N84-32628

DEFORMATION
Textile ballistic performance (data base) [AD-A143249] N84-32541
The 64-m antenna automatic subreflector focusing controller N84-32628
Diagenesis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938

DEGRADATION
Physical techniques for profiling heterogeneous polymer degradation [DE84-013807] N84-32547
Forecasting of high voltage insulation performance: Testing of recommended potting materials and of capacitors [NASA-TM-85536] N84-32681
Aggradation and degradation at alluvial-channel beds [PB84-201557] N84-32905

DEGREES OF FREEDOM
A mathematical simulation model of the CH-46B helicoptar, volume 2 [NASA-TM-84351] N84-32380
Distribution results for positive definite quadratic forms with repeated roots [AD-A143450] N84-33115

DEICERS
Piezoelectric deicing device [NASA-CASE-LEW-13773-2] N84-32782

DELAY LINES
Digital multi-tapped delay line with automatic time-domain programming [AD-D011136] N84-32676

DELPHI METHOD (FORECASTING)
The role of the state library agency in the future: A Delphi study N84-33258

DEMODULATION
Coherent digital demodulation of a residual carrier signal using IF sampling N84-32634

DENMARK
Handling of hydrazine in the Royal Danish Air Force N84-33014

DENSITY (MASS/VOLUME)
Solar tides in the mesospheric sodium layer [INPE-2942-TDL/151] N84-32953
Liquified natural gas densities: Summary of research program at the National Bureau of Standards [PB84-202647] N84-33297

DENSITY MEASUREMENT
Hydrographic measurements in the western Arlboran Sea, October 1982 [AD-A143588] N84-32985
Liquified natural gas densities: Summary of research program at the National Bureau of Standards [PB84-202647] N84-33297

DEOXYRIBONUCLEIC ACID
Roles of ionizing radiation in cell transformation [DE84-013397] N84-32995

DEPLOYMENT
Quick Deployment Vehicle (QDV) [AD-D011060] N84-32563

DEPOSITION
Investigation of the state of materials in plasma deposition of refractory coatings [BLL-M-35686-(5828.4)] N84-32485
Wafer-scale laser pantography. Part 6: Direct-write interconnection of VLSI gate arrays [DE84-012676] N84-32815
Lower tertiary biostratigraphy and paleoecology of the Quilcene-Discovery Bay area, northeast Olympic Peninsula, Washington N84-32943
Process for the epitaxial deposition of III-V compounds utilizing a binary alloy as the metallic source [AD-D011097] N84-33229
Mechanisms involved in the glow-discharge deposition of doped hydrogenated amorphous silicon [DE84-013124] N84-33236
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films [DE84-013122] N84-33246

DEPTH MEASUREMENT
Underwater depth telemetry [AD-D011054] N84-32418

DESALINIZATION
Reference plant for high temperature electrodialysis desalting of seawater [PB84-195841] N84-32471

DESERTS
Geology, petrology and geochronology of the metamorphic rocks of Meatiq Dome, Central Eastern Desert, Egypt N84-32942
Morphologic studies of the Moon and planets [NASA-CR-173886] N84-33319

DESIGN ANALYSIS
Energy efficient engine component development and integration program [NASA-CR-173884] N84-32389
A high energy stage for the National Space Transporation System [NASA-TM-83795] N84-32411
Preliminary design of a 10-kW thermophotovoltaic system for space applications [NASA-TM-83768] N84-32427
Advancement of developmental technology for pulse combustion applications [PB84-215268] N84-32576
Magnetic refrigeration development N84-32626
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations [NASA-CR-173918] N84-32683
Source-circuit design with multiple photovoltaic manufacturers N84-32685
Hot-spot investigations of utility scale panel configurations N84-32687
Design and selection of bypass diodes N84-32688
Plasma switch development [AD-A143233] N84-32711
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner [NASA-TM-83785] N84-32789
New machines for grinding, facetting and profiling hard materials [CSIR-TRANS-1750] N84-32821
Design of a high-performance slide and drive system for a small precision machining research lathe [DE84-011059] N84-32845
Design spectrum analysis in NASTRAN N84-32870
Research on output feedback control of systems with ill-conditioned dynamics [NASA-CR-173921] N84-33071
Sensor correlation and data fusion theory [AD-A143587] N84-33133
Custom integrated circuits N84-33361

DESORPTION
Negative ion formation due to hydrogen plasma surface interaction [DE84-012259] N84-33192
Molecule microscopy N84-33337

DETERMINANTS
Determinants connected with a trace on a Banach algebra N84-33036
Bounded Hessian functions N84-33048

DETONATION
Influence of diluents and inhibitors on detonations [DE84-006300] N84-32463

DEUTERIUM COMPOUNDS
Experimental and model transport and diffusion studies in complex terrain with emphasis on tracer studies [DE84-013076] N84-32975

DIAMONDS
Metal coating of diamond abrasives (review of foreign patents)
[CSIR-TRANS-1740] N84-32489
Pastes of superhard materials (review of inventions)
[CSIR-TRANS-1741] N84-32491
Effect of formation conditions and contact zone structure on adhesion strength of carbide forming metal coatings on diamond
[CSIR-TRANS-1735] N84-32492
Coatings on diamond and CBN abrasives (review of inventions)
[CSIR-TRANS-1742] N84-32525
A diffusion mechanism in the catalytic conversion of carbonaceous materials into diamonds at high pressures
[CSIR-TRANS-1743] N84-32526
Diamond synthesis from various graphites
[CSIR-TRANS-1749] N84-32528
Forty years of development in diamond tools
[CSIR-TRANS-1730] N84-32564
The octahedron-rhombododecahedron morphological series of synthetic diamond crystals
[CSIR-TRANS-1746] N84-33205
Diamond surface: Atomic and electronic structure
[DE84-013518] N84-33234

DIAPHRAGMS (MECHANICS)
Free bulging of round diaphragm exposed to uniform pressure in state of creep
[BLL-M-35680-(5828.4)] N84-32661

DIELECTRIC PROPERTIES
Electrical and differential scanning calorimetry studies of poly(ethylene oxide) complexed with alkaline earth thiocyanates
[AD-A143198] N84-32449
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers
[AD-A143202] N84-32451
Current assessment of the potential of dielectric gas mixtures for industrial applications
[DE84-011658] N84-32724

DIELECTRICS
Electroding of multi-layered epitaxial structures
[AD-D011137] N84-33209

DIESEL ENGINES
Steam bottoming cycle for an adiabatic diesel engine
[NASA-CR-168255] N84-33304
Computer simulation of the heavy-duty turbo-compounded diesel cycle for studies of engine efficiency and performance
[NASA-CR-174755] N84-33306

DIFFERENTIAL AMPLIFIERS
Measurement amplifier
[NASA-CASE-MFS-25868-1] N84-32680

DIFFERENTIAL EQUATIONS
Investigation of the state of materials in plasma deposition of refractory coatings
[BLL-M-35686-(5828.4)] N84-32465
Stresses and displacements in linear Maxwell non-isothermal circular plates on Winkler foundation and with radial and transverse variation in material properties N84-32656
Analysis of parametrically excited large vibration systems
[AD-A143283] N84-32679
Fatou theorem for the proper functions of invariant potential operators by a group of Cartan displacements N84-33037
Algorithmic integration of elementary transcendental functions on an algebraic curve N84-33052
The design and performance of a parallel computer architecture for simulation N84-33054
MECA: A supercomputer for Monte Carlo
[DE84-014129] N84-33066
Parameter estimation for the Euler-Bernoulli-beam
[NASA-CR-172417] N84-33107
Analytical solution for computing first and second order ordinary differential equations using a method of series development
[INPE-2980-PRE/442] N84-33110
Some practical Runge-Kutta formulas
[DE84-013539] N84-33123

DIFFRACTION
Measurement of the transverse mode excitation in the stimulated emission of the ACO free electron laser
[AD-A143449] N84-32808
Numerical diffraction by a uniform grid
[DE84-012861] N84-33121
Polynominal grating
[AD-D011090] N84-33186

DIFFRACTION PATTERNS
Thermoscopic study of diffraction current distribution N84-32563

DIFFUSION
Generalization of results of electro-simulation of temperature of the piece during centrifugal cladding
[BLL-M-35687-(5828.4)] N84-32479
Topochemical reactions and the Stefan problem
[BLL-M-35671-(5828.4)] N84-32501
Molten carbonate fuel cell performance model update
[DE84-012932] N84-32733
Report of tests of a compressor configuration of CD (Controlled Diffusion) blading
[AD-A143499] N84-32832
Experimental and model transport and diffusion studies in complex terrain with emphasis on tracer studies
[DE84-013076] N84-32975

DIGITAL DATA
Design of a digital telemetry data collection system
[DE84-013916] N84-32420
Peculiarities in construction of optical receivers for digital fiber-optic communication lines N84-32596
Coherent digital demodulation of a residual carrier signal using IF sampling N84-32634
MAGSAT correlations with geoid anomalies — magnetic anomalies in the western Gulf of Mexico
[E84-10190] N84-32894
Computer calculated analysis of subsurface formation porosities in central New York state N84-32941
Quantitative analysis of satellite infrared imagery using digital storage equipment
[INPE-2978-PRE/440] N84-33074
Degrees of adjacency or surroundedness
[AD-A143528] N84-33118

DIGITAL INTEGRATORS
Quantitative analysis of satellite infrared imagery using digital storage equipment
[INPE-2978-PRE/440] N84-33074

DIGITAL RADAR SYSTEMS
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650
High frequency radar software reference manual for product one
[PB84-194665] N84-32665

DIGITAL SYSTEMS
A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers
[NASA-TM-85873] N84-32393
Underwater depth telemetry
[AD-D011054] N84-32418
Peculiarities in construction of optical receivers for digital fiber-optic communication lines N84-32596
Coherent digital demodulation of a residual carrier signal using IF sampling N84-32634
Digital multi-tapped delay line with automatic time-domain programming
[AD-D011136] N84-32676
Photodigitizing procedures
[AD-A143589] N84-32793
The use of pipeline techniques in the architecture of digital processors employed in real time applications
[INPE-2992-TDL/153] N84-33075

DIGITAL TECHNIQUES
Development and characterization analysis of a radar polarimeter
[NASA-CR-175259] N84-32785
The compression of digital imagery by transformation
[INPE-2893-PRE/412] N84-33073
Quantitative analysis of satellite infrared imagery using digital storage equipment
[INPE-2978-PRE/440] N84-33074
Photon correlation spectroscopy and applications N84-33352
Digital signal processing N84-33357

DIGITAL TO ANALOG CONVERTERS
Cognitive information processing N84-33360

DIHYDRIDES
Review of solar fuel-producing quantum conversion processes
[NASA-CR-173904] N84-32916

DILUENTS
Influence of diluents and inhibitors on detonations
[DE84-006300] N84-32483
Properties of UV-curable polyurethane acrylates: Effect of reactive diluent
[AD-A143241] N84-32540

DIMENSIONS
Measurement of the transverse mode excitation in the stimulated emission of the ACO free electron laser
[AD-A143449] N84-32808

DIODES
Modulation of microwave power with electron transfer diodes N84-32610

DIPHENYL COMPOUNDS
Cure reactions, network structure and mechanical response of diaminodiphenyl sulfone cured tetraglycidyl 4,4'diaminodiphenyl methane
[DE84-012607] N84-32548

DIRAC EQUATION
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160

DIRECT POWER GENERATORS
Bi-directional control system for energy flow in a solar powered flywheel
[NASA-CASE-MFS-25978-1] N84-32913

DIRECTIONAL ANTENNAS
Synthesis of antennas with weak superdirectivity N84-32581

DIRECTORIES
An online directory of databases for material properties
[DE84-013210] N84-33099

DISCONNECT DEVICES
Adjustable self-releasing hook
[AD-D011082] N84-32834

DISCRETE FUNCTIONS
On accuracy conditions for the numerical computation of waves
[NASA-CR-172433] N84-33111

DISPERSING
A theoretical and experimental study of turbulent evaporating sprays
[NASA-CR-174760] N84-32390

DISPLACEMENT
Stresses and displacements in linear Maxwell non-isothermal circular plates on Winkler foundation and with radial and transverse variation in material properties N84-32656
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32657
Horizontal cylindrical vessels supported by saddles subjected to vertical and lateral force fields N84-32658
Accuracy of three dimensional solid finite elements N84-32667

DISPLAY DEVICES
Aircraft liftmeter
[NASA-CASE-LAR-12518-1] N84-32383
Light-emitting diode matrix flat screen N84-32592
Video noise reduction
[BBC-RD-1984/7] N84-32615
Comparison of CRT (Cathode Ray Tube) antireflection filters
[PB84-202753] N84-32742
Programming productivity enhancement by the use of application generators
[AD-A143532] N84-33080

DISSIPATION
Warm fog dissipation using large volume water sprays
[NASA-CASE-MFS-25962-1] N84-32398

DISSOCIATION
Gas chromatographic analysis of nitrogen
[BLL-RISLEY-TRANS-4563-(9091.9)] N84-32443

DISTANCE
The feasibility, practicality and utility of P-3 inflight refueling
[AD-A143419] N84-32382

DISTORTION
Potential surface improvements by bump removal for 64-m antenna N84-32627
Optical distortion analyzer system
[AD-D011127] N84-33176

DISTRIBUTED PARAMETER SYSTEMS
Theoretical issues in the design and verification of distributed systems N84-33096

DISTRIBUTED PROCESSING
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 1: Executive summary
[NASA-CR-175261] N84-32646
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 2: Design and development
[NASA-CR-175262] N84-32647
Extending binary Byzantine agreement to multivalued Byzantine agreement
[AD-A143424] N84-33077
The effect of queueing disciplines on response times in distributed systems
[DE84-012639] N84-33086
System analysis for the Huntsville Operational Support Center distributed computer system
[NASA-CR-171136] N84-33097
The allocation of data and programs in distributed data processing environments N84-33261
Updating replicated files in real time distributed processing systems N84-33264
NASA Administrative Data Base Management Systems, 1984
[NASA-CP-2323] N84-33266
Asynchronous file transfer to IBM PC's N84-33275
LaRC local area networks to support distributed computing N84-33281

DISTRIBUTION
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32954
DISTRIBUTION FUNCTIONS
Bounded Hessian functions N84-33048
Distributions of central quadratic forms in normal variables: A comparison of algorithms
[AD-A143468] N84-33116
TP2 orderings
[AD-A143434] N84-33132
Radial distribution function as an analysis technique
[DE84-013242] N84-33235
DIURNAL VARIATIONS
Solar tides in the mesospheric sodium layer
[INPE-2942-TDL/151] N84-32953
DIVERGENCE
A determination of the charge state of energetic magnetospheric ions by the observation of drift echoes
[AD-A143181] N84-32954
DOCUMENT STORAGE
Conceptual design of a monitoring system for the Charters of Freedom
[NASA-CR-173909] N84-33285
DOCUMENTATION
Flight systems raster graphics software reference manual
[ARL-SYS-TM-72] N84-33072
Adaptive subject description in document retrieval N84-33296
DOLOMITE (MINERAL)
Diagenesis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32936
DOMAINS
Analytic automorphisms of a bounded Reinhardt domain in a complex Banach space with base N84-33044
DONOR MATERIALS
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors
[AD-A143551] N84-33225
DOORS
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door
[NASA-CR-171732] N84-32416
DOPED CRYSTALS
High-speed thyristors on weakly doped GaAs N84-32600
FET charge sensor and voltage probe
[NASA-CASE-NPO-16045-1] N84-33211
Anomalous pressure dependence of dipolar relaxation times in rare earth doped lead fluoride
[AD-A143201] N84-33215
Mechanisms involved in the glow-discharge deposition of doped hydrogenated amorphous silicon
[DE84-013124] N84-33236
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246
DOPPLER EFFECT
Simultaneous detection of time coincident signals in an adaptive Doppler tracker
[AD-D011092] N84-32659
Frequency correlation of HF skywave ground backscatter Doppler spectra
[PB84-204353] N84-32668
Statistics of HF skywave ground backscatter Doppler spectra
[PB84-204973] N84-32669
High-frequency acoustic backscatter from the sea surface
[AD-A143536] N84-33152
DOPPLER RADAR
Autocorrelation receiver for Doppler short-range radar systems N84-32580
Practical problems with CO2 laser radar tests
[RAE-TRANS-2113] N84-32804
DOSIMETERS
Develop real-time dosimetry concepts and instrumentation for long-term missions
[NASA-CR-171809] N84-32791
Passive sampling device for ambient air and personal monitoring
[PB84-210046] N84-32798
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies
[AD-A143507] N84-32992
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010
DRAG
Quantum optics and photonics N84-33344
DRAG REDUCTION
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173660] N84-32395
DRILL BITS
Forty years of development in diamond tools
[CSIR-TRANS-1730] N84-32564
DROPSONDES
Investigation into the internal aerodynamic design and associated errors in a fast descent ducted sonde for the measurement of atmospheric pressure and temperature (AMPARS phase 2)
[AD-A143189] N84-32969
DUALITY PRINCIPLE
Duality in inexact fractional programming with set-inclusive constraints
[DE84-023584] N84-33092
DUALITY THEOREM
Duality in inexact fractional programming with set-inclusive constraints
[DE84-023584] N84-33092
DUCTED FLOW
Developing turbulent flow in strongly curved passages of square and circular cross-section
[AD-A143279] N84-32755
DUCTILITY
Role of grain size on the brittle to ductile transition of the strongly ordered alloy Ni3Al
[DE84-014904] N84-32519
DUCTS
Laser beam duct pressure controller system
[AD-D011102] N84-32611
DUST
The climatic impact of volcanic activity N84-32963
DYES
Optical and electrical properties of organic dye crystals
[DE84-014930] N84-33240
DYNAMIC CHARACTERISTICS
Dynamics of angular movements of a solid supporting a rotating rotor with consideration of energy dissipation
[AD-A143349] N84-32881
DYNAMIC MODELS
A theoretical and experimental study of turbulent evaporating sprays
[NASA-CR-174760] N84-32390
Linearized dynamical model for the NASA/IEEE SCOLE configuration
[NASA-CR-172394] N84-32423
Relative motion characteristics of 2 near-Earth Satellites
[NASA-CR-173667] N84-33316
DYNAMIC PROGRAMMING
Dynamic programming and transitive closure on linear pipelines
[AD-A143527] N84-33079
DYNAMIC RESPONSE
A two-fluid instability
[DE84-012899] N84-32764
The development of methods to predict both the dynamic and the pseudo-static response of secondary structures subjected to seismic excitations
[DE84-010284] N84-32884
DYNAMIC STRUCTURAL ANALYSIS
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353
Structural performance of orthogonal tetrahedral truss Space Station configurations
[NASA-TM-86260] N84-32422
Application of elastic wave scattering theory to the detection and characterization of flaws in structural materials
[DE84-013729] N84-32852
Analysis of parametrically excited large vibration systems
[AD-A143283] N84-32879
DYNAMIC TESTS
A theory of error-based testing
[AD-A143533] N84-33081

E

E REGION
Influence of magnetic shear on the collisional current driven ion cyclotron instability
[AD-A143391] N84-33191
EARTH (PLANET)
Dynamic model of the Earth's upper atmosphere
[NASA-CR-3835] N84-32965
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320
EARTH MOVEMENTS
Seismic hazard study for selected sites in New Mexico and Nevada
[AD-A143392] N84-32960
EARTH ORBITS
Spinoff, 1984
[NASA-TM-85596] N84-33305
EARTH RADIATION BUDGET EXPERIMENT
Science support for the Earth radiation budget sensor on the Nimbus-7 spacecraft
[NASA-CR-175251] N84-32948
EARTHQUAKES
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States
[DE84-013672] N84-32901
ECHOES
A determination of the charge state of energetic magnetospheric ions by the observation of drift echoes
[AD-A143181] N84-32954
ECONOMIC ANALYSIS
Shuttle detached spacecraft
[AD-A143320] N84-32417
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1
[AD-A143248] N84-32830
Oversight on the Federal Aviation Administration fiscal year 1985 research, engineering and development budget request
[GPO-34-924] N84-33302
ECONOMIC IMPACT
Impact of robots and computers on the work force of the 1960's
[GPO-31-912] N84-32826
Agriculture weather services
[GPO-27-913] N84-32966
Effects of expiration of the Federal energy tax credit on the National Photovoltaics Program
[NASA-CR-173900] N84-33299
ECONOMICS
Economic cases of the Civil Aeronautics Board, volume 104, October - November 1983
[PB84-209287] N84-32370
New techniques for adjusting reference factors
[DE84-012649] N84-33300
EDGE DISLOCATIONS
Influence of choice of pair-interaction potential on results of modelling an edge dislocation in Alpha-iron
[BLL-M-35682-(5828.4)] N84-32499
EDGE LOADING
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
EDITING ROUTINES (COMPUTERS)
Editing by example N84-33070
EDUCATION
ADA (trademark) training curriculum. Programming methodology m203 teacher's guide
[AD-A143581] N84-33082
ADA (trademark) training curriculum. Basic ADA programming l202 teacher's guide, volume 1
[AD-A143584] N84-33083
ADA (trademark) training curriculum. Basic ADA programming l202 teacher's guide, volume 2
[AD-A143585] N84-33084
NASA Ames summary high school apprenticeship research program, 1983 research papers
[NASA-TM-85931] N84-33365
EFFICIENCY
Improved heat exchanger for electrothermal devices
[NASA-CASE-LEW-14037-1] N84-32425
Interrelation between parameters of M-type traveling wave tube N84-32598
High efficiency heat pump using ground heat source
[DE84-006385] N84-32761
EGYPT
Geology, petrology and geochronology of the metamorphic rocks of Meatiq Dome, Central Eastern Desert, Egypt N84-32942
EIGENVALUES
Relationships among classes of spherical matrix distributions
[AD-A143215] N84-33128
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
EJECTION INJURIES
Position and restraint system for aircrewman
[AD-D011058] N84-32364
EJECTION SEATS
Position and restraint system for aircrewman
[AD-D011058] N84-32364
EJECTORS
Axisymmetric thrust augmenting ejector with discrete primary air slot nozzles
[AD-D011129] N84-32386

ELASTIC BODIES
Simplifications in the simulation of mechanisms containing flexible members N84-32655
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874
Parameter estimation for the Euler-Bernoulli beam [NASA-CR-172417] N84-33107
ELASTIC PROPERTIES
Effective thermophysical and elastic properties of materials with voids [DE84-013942] N84-32465
Opening of an interface flaw in a layered elastic half-plane under compressive loading [NASA-TM-86282] N84-32877
Simple examples of non linear truss behavior [AD-A143368] N84-32882
Fiber optic sensor with enhanced immunity to random environmental perturbations [AD-D011115] N84-33174
ELASTIC SCATTERING
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-dadron systems, hadron form factors, and Dirac particles [DE84-012971] N84-33161
ELASTIC WAVES
Application of elastic wave scattering theory to the detection and characterization of flaws in structural materials [DE84-013729] N84-32852
ELASTODYNAMICS
Analysis of dynamic mixed-mode crack tip stress patterns [AD-A143329] N84-32880
ELASTOMERS
Breakdown of organic insulators N84-32694
ELECTRIC ARCS
Breakdown processes in large-area cold-cathode vacuum triodes [DE84-014026] N84-32817
ELECTRIC AUTOMOBILES
Recent results from the National Battery Test Laboratory [DE84-012110] N84-32729
ELECTRIC BATTERIES
Lithium-alloy/metal sulfide battery research [DE84-013427] N84-32720
Effects of standtime on the available capacity of lead-acid and nickel/iron electric vehicle batteries [DE84-013452] N84-32721
Recent results from the National Battery Test Laboratory [DE84-012110] N84-32729
General energy balance for battery systems [DE84-013235] N84-32731
Review of flow battery testing at Sandia [DE84-011186] N84-32734
Electrode-active material for electrochemical batteries and method of preparation [DE84-014508] N84-32739
Battery Computer System (BCS) human factors field evaluation [AD-A143425] N84-33062
ELECTRIC BRIDGES
A study of the high frequency limitations of series resonant converters [NASA-CR-173866] N84-32678
ELECTRIC CONDUCTORS
Electronically conductive ceramics for high temperature oxidizing environments [DE84-014506] N84-32549
Electrode-active material for electrochemical batteries and method of preparation [DE84-014508] N84-32739
ELECTRIC CONNECTORS
Source circuit design considerations N84-32690
ELECTRIC CONTACTS
Josephson point contacts noise properties at microwave N84-32602
Grounding ring for shielded cable [AD-D011135] N84-32675
ELECTRIC CURRENT
Dynamics of normal-zone propagation in Ta at small currents [DE84-009990] N84-33245
ELECTRIC DISCHARGES
Pulsed hydrogen-fluoride laser [MRL-R-831] N84-32803
Particle environment — solar arrays and electric discharges [NASA-CR-173868] N84-33210
ELECTRIC FIELDS
Mathematical model of electrostatic precipitation (revision 3). Volume 1: Modeling and programming [PB84-212679] N84-32469
Spatial electron density and electric field strength measurements in microwave cavity experiments [NASA-CR-173907] N84-32682
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies [AD-A143507] N84-32992
Time development of Cerenkov radiation [AD-A143225] N84-33155
ELECTRIC GENERATORS
Hipot and continuity qualification est experience N84-32692
ELECTRIC MOTOR VEHICLES
Effects of standtime on the available capacity of lead-acid and nickel/iron electric vehicle batteries [DE84-013452] N84-32721
ELECTRIC POTENTIAL
Characterization of physiochemical properties of polymeric and electrochemical materials for aerospace flight [NASA-CR-175258] N84-32534
Hipot and continuity qualification est experience N84-32692
Characterization of voltage losses during high-intensity current pulses in reactive, porous electrodes of molten salt cells [DE84-012112] N84-32730
A new solar cell design for improved open circuit voltage and high efficiency [NASA-CASE-NPO-16126-1] N84-32911
Particle environment — solar arrays and electric discharges [NASA-CR-173868] N84-33210
ELECTRIC POWER PLANTS
DC wiring system grounding and ground fault protection issues for central station photovoltaic power plants N84-32695
Electrical safety for high voltage arrays N84-32697
ELECTRIC PULSES
Pulsed power for racetrack induction accelerators [AD-A143289] N84-33157
ELECTRIC SWITCHES
Plasma switch development [AD-A143233] N84-32711
ELECTRICAL ENGINEERING
USSR report: Electronics and electrical engineering [JPRS-UEE-84-006] N84-32580
ELECTRICAL FAULTS
Dielectric breakdown distributions of large dielectric constant liquids [DE84-013216] N84-32461
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations [NASA-CR-173918] N84-32683
Hot-spot investigations of utility scale panel configurations N84-32687
Electrical insulation design requirements and reliability goals N84-32691
Laboratory experience with voltage breakdown N84-32693
Breakdown of organic insulators N84-32694
Photovoltaic system grounding and fault protection N84-32696
Grounding and fault protection of the SMUD PVI array N84-32698
Photovoltaic central station step and touch potential considerations in grounding system design N84-32699
Breakdown processes in large-area cold-cathode vacuum triodes [DE84-014026] N84-32817
ELECTRICAL GROUNDING
DC wiring system grounding and ground fault protection issues for central station photovoltaic power plants N84-32695
Photovoltaic system grounding and fault protection N84-32696
Grounding and fault protection of the SMUD PVI array N84-32698
Photovoltaic central station step and touch potential considerations in grounding system design N84-32699
ELECTRICAL INSULATION
Effect of processing conditions on the reliability of crosslinked polyethlene cable insulation [DE84-014902] N84-32548
Forecasting of high voltage insulation performance: Testing of recommended potting materials and of capacitors [NASA-TM-85536] N84-32681
Electrical insulation design requirements and reliability goals N84-32691
Laboratory experience with voltage breakdown N84-32693
Breakdown of organic insulators N84-32694
DC (Direct-Current) partial-discharge-environmental screening of space TWTs (Traveling Wave Tubes) [AD-A143230] N84-32710
Current assessment of the potential of dielectric gas mixtures for industrial applications [DE84-011658] N84-32724
ELECTRICAL MEASUREMENT
Interrelation between parameters of M-type traveling wave tube N84-32598
Source circuit design considerations N84-32690
Qualification tests and electrical measurements: Practice and problems N84-32703
Qualification testing and electrical measurement experience: A manufacturer's view N84-32705
ELECTRICAL PROPERTIES
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors [INPE-3045-TDL/157] N84-33212
Anomalous pressure dependence of dipolar relaxation times in rare earth doped lead fluoride [AD-A143201] N84-33215
Theory of the electronic properties of mercury-cadmium-telluride alloys [AD-A143426] N84-33221
Studies of structural properties and their relationship to critical parameters in superconducting materials [AD-A143556] N84-33227
Non-destructive testing of semiconductors using surface acoustic wave [AD-A143559] N84-33228
Defect clusters and electrical properties in transition metal monoxides [DE84-014851] N84-33242
ELECTRICAL RESISTANCE
Solid-phase reaction of dispersed graphitized material with aluminium and nickel [BLL-M-35633-(5828.4)] N84-32482
ELECTRICAL RESISTIVITY
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers [AD-A143202] N84-32451
Electrically conducting poly(vinyl acetate) [AD-A143199] N84-32536
High-speed thyristors on weakly doped GaAs N84-32600
Photovoltaic system grounding and fault protection N84-32696
Mechanisms of electrical conductivity in olivine [DE83-017313] N84-32723
ELECTRICITY
Improved heat exchanger for electrothermal devices [NASA-CASE-LEW-14037-1] N84-32425
Modeling of lethal electric shock N84-33000
ELECTRO-OPTICS
Large aperture electro-optical switch [DE84-013089] N84-32726
New machines for grinding, facetting and profiling hard materials [CSIR-TRANS-1750] N84-32821
Influence of the interfacial layer on electrooptical properties of heterojunction solar cells [DE84-013285] N84-32925
ELECTROCHEMICAL CELLS
Chemical stability of beta-aluminum [DE84-009635] N84-32545
ELECTROCHEMISTRY
Electrochemical performance of porous nickel sulfide electrodes [DE84-009586] N84-32741
Technology Base Research Project for Electrochemical Energy Storage [DE84-013877] N84-32930
Molecule microscopy N84-33337
ELECTRODE MATERIALS
Electronically conductive ceramics for high temperature oxidizing environments [DE84-014506] N84-32549
Lithium-alloy/metal sulfide battery research [DE84-013427] N84-32720
Electrode-active material for electrochemical batteries and method of preparation [DE84-014508] N84-32739
ELECTRODEPOSITION
Electroding of multi-layered epitaxial structures [AD-D011137] N84-33209
ELECTRODES
Raman and infrared spectroscopy of molecules adsorbed on metal electrodes [AD-A143466] N84-32454
Characterization of voltage losses during high-intensity current pulses in reactive, porous electrodes of molten salt cells [DE84-012112] N84-32730
Electrode-active material for electrochemical batteries and method of preparation [DE84-014508] N84-32739
Negative electrode catalyst for the iron-chromium REDOX energy storage system [NASA-CASE-LEW-14026-1] N84-32909

The interpretation of very low frequency Raman scattering from roughened silver electrodes: Clusters, cavities or complexes?
[AD-A143471] N84-33184
Electroding of multi-layered epitaxial structures
[AD-D011137] N84-33209
ELECTRODIALYSIS
Reference plant for high temperature electrodialysis desalting of seawater
[PB84-196841] N84-32471
ELECTRODYNAMICS
Approximation models for electrodynamic systems in solid state millimetric wave devices N84-32606
Atomic resonance and scattering N84-33339
ELECTROLYSIS
Summary status of advanced water electrolysis and hydrogen storage/transport research and development
[DE84-012906] N84-32456
ELECTROLYTE METABOLISM
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005
ELECTROLYTES
Ampule tests to simulate glass corrosion in ambient temperature lithium batteries, volume 2
[DE84-014330] N84-32732
Review of flow battery testing at Sandia
[DE84-011186] N84-32734
The interpretation of very low frequency Raman scattering from roughened silver electrodes: Clusters, cavities or complexes?
[AD-A143471] N84-33184
ELECTROLYTIC CELLS
A review and summary of cell and module mismatch losses from theoretical and experimental studies N84-32689
Deactivation of thionyl chloride cells
[AD-D011113] N84-32908
ELECTROMAGNETIC ABSORPTION
Propagation and absorption of electromagnetic waves in fully relativistic plasmas
[DE84-013627] N84-33204
ELECTROMAGNETIC FIELDS
Immunologic effects of electromagnetic fields (1981 - 1983)
[PB84-190602] N84-33008
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160
Autogenerator of beams of charged particles
[DE84-014242] N84-33163
Optical propagation and communication N84-33355
ELECTROMAGNETIC INTERACTIONS
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160
ELECTROMAGNETIC INTERFERENCE
INTERMD: A computer program to predict intermodulation product generation on two-way FM radio frequencies
[DE84-013767] N84-32661
ELECTROMAGNETIC NOISE
Josephson point contacts noise properties at microwave N84-32602
ELECTROMAGNETIC PULSES
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160
ELECTROMAGNETIC RADIATION
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946
Electromagnetic wave theory and remote sensing N84-33350
ELECTROMAGNETIC SCATTERING
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-173916] N84-32645
ELECTROMAGNETIC WAVE TRANSMISSION
Reflection of electromagnetic waves from inhomogeneous media N84-32586
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers
[AD-A143318] N84-32655
ELECTROMECHANICS
Analysis, testing, and evaluation of faulted and unfaulted Wye, Delta, and open Delta connected electromechanical actuators
[NASA-CR-171606] N84-32707
ELECTRON BEAMS
Radiation from intense electron beams associated with the Cherenkov mechanism
[AD-A143350] N84-32657
Plasma switch development
[AD-A143233] N84-32711
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957
Particle environment — solar arrays and electric discharges
[NASA-CR-173888] N84-33210
ELECTRON BUNCHING
Time development of Cerenkov radiation
[AD-A143225] N84-33155
ELECTRON CYCLOTRON HEATING
Focusing twist reflector for electron-cyclotron resonance heating in the Tandem Mirror Experiment-upgrade
[DE84-012954] N84-32663
ELECTRON DENSITY (CONCENTRATION)
Spatial electron density and electric field strength measurements in microwave cavity experiments
[NASA-CR-173907] N84-32682
The ionization structure of planetary nebulae V NGC 3242
[NASA-CR-173914] N84-33322
Studies of the microscale density fluctuations in the solar wind using interplanetary scintillations N84-33324
ELECTRON DIFFRACTION
Diamond surface: Atomic and electronic structure
[DE84-013518] N84-33234
ELECTRON DISTRIBUTION
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946
ELECTRON ENERGY
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013861] N84-33198
Relativistic calculations and measurements of energies, Auger rates, and lifetimes
[AD-A143423] N84-33220
The ionization structure of planetary nebulae V NGC 3242
[NASA-CR-173914] N84-33322
ELECTRON MICROSCOPY
Structure of polycrystalline boron nitride as determined by electron microscopic thin sections
[CSIR-TRANS-1736] N84-32533
ELECTRON PARAMAGNETIC RESONANCE
Electronic properties of amorphous silicon dioxide N84-33351
ELECTRON SOURCES
Source circuit design considerations N84-32690
ELECTRON STATES
Relativistic calculations and measurements of energies, Auger rates, and lifetimes
[AD-A143423] N84-33220
ELECTRON TRANSFER
Modulation of microwave power with electron transfer diodes N84-32610
ELECTRONIC AIRCRAFT
Radio frequency distribution assembly
[AD-A143575] N84-32658
ELECTRONIC COUNTERMEASURES
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619
ELECTRONIC EQUIPMENT
Digital multi-tapped delay line with automatic time-domain programming
[AD-D011136] N84-32676
ELECTRONIC WARFARE
Radio frequency distribution assembly
[AD-A143575] N84-32658
ELECTRONS
Numerical calculations of the function of the static receptivity of electrons in metals
[BLL-M-35640-(5828.4)] N84-32480
Relativistic calculations and measurements of energies, Auger rates, and lifetimes
[AD-A143423] N84-33220
ELECTROPLATING
Procedure for the electroplating of sintered materials containing carbide or cast alloys of tungsten, molybdenum, titanium or zirconium
[BLL-RISLEY-TRANS-4557-(9091.9)] N84-32484
ELECTROSTATIC PRECIPITATORS
Mathematical model of electrostatic precipitation (revision 3). Volume 1: Modeling and programming
[PB84-212679] N84-32469
Mathematical model of electrostatic precipitation (revision 3). Volume 2: User's manual
[PB84-212687] N84-32470
ELECTROSTATIC SHIELDING
Grounding ring for shielded cable
[AD-D011135] N84-32675
ELECTROTHERMAL ENGINES
Improved heat exchanger for electrothermal devices
[NASA-CASE-LEW-14037-1] N84-32425
ELEVATION ANGLE
Potential surface improvements by bump removal for 64-m antenna N84-32627
ELLIPTIC DIFFERENTIAL EQUATIONS
Singularities connected with a trace on a Banach algebra N84-33034
High-order sparse factorization methods for elliptic boundary value problems
[DE84-012562] N84-33122
ELUTION
Multivariate curve resolution in liquid chromatography
[DE84-013797] N84-32466
EMBEDDED COMPUTER SYSTEMS
Editing by example N84-33070
EMISSION
Locating and estimating air emissions from sources of chloroform
[PB84-200617] N84-32935
EMISSION SPECTRA
Relation of vertical intensity profiles for neutral atom lines to analyte atomization behavior in inductively coupled plasmas
[DE84-014126] N84-33194
EMITTERS
Preliminary design of a 10-kW thermophotovoltaic system for space applications
[NASA-TM-83766] N84-32427
High power microwave generator
[DE84-014230] N84-32738
ENAMELS
Features of behaviour of gas bubbles in molten oxide films during enameling
[BLL-M-35672-(5828.4)] N84-32496
ENCLOSURES
Natural convection in porous media: An experimental and numerical study for vertical annular and rectangular enclosures N84-32744
ENDOCRINE SECRETIONS
Effects of insulin and hydrocortisone on energy metabolism in rats irradiated with fast, 60 MeV neutrons N84-33002
ENDOLYMPH
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33016
ENERGY BANDS
Theory of the electronic properties of mercury-cadmium-telluride alloys
[AD-A143426] N84-33221
ENERGY CONSERVATION
Scenario planning: Energy considerations in the long range urban transportation planning process
[DE84-013590] N84-33308
ENERGY CONSUMPTION
Pulse driver for flux gate magnetometer
[AD-D011053] N84-32774
ENERGY CONVERSION EFFICIENCY
The NASA photovoltaic technology program
[NASA-TM-83665] N84-32426
Conceptual design of a noncontacting power transfer device for the ASPS Vernier system
[NASA-CR-172238] N84-32677
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations
[NASA-CR-173918] N84-32683
Source-circuit design overview N84-32684
Source-circuit design with multiple photovoltaic manufacturers N84-32685
High power microwave generator
[DE84-014230] N84-32738
Stable density stratification solar pond
[NASA-CASE-NPO-15419-2] N84-32910
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
Bi-directional control system for energy flow in a solar powered flywheel
[NASA-CASE-MFS-25978-1] N84-32913
Review of solar fuel-producing quantum conversion processes
[NASA-CR-173904] N84-32916
High-efficiency multi-colored photovoltaic cells
[PB84-200575] N84-32932
ENERGY DISSIPATION
Low heat loss laser combustion chamber
[AD-D011107] N84-32799
Dynamics of angular movements of a solid supporting a rotating rotor with consideration of energy dissipation
[AD-A143349] N84-32881
Spherically symmetric radiation in gravitational collapse N84-33312
ENERGY GAPS (SOLID STATE)
Drift mobilities by time-of-flight methods and time-dependent photoransport in the nanosecond regime in amorphous semiconductors
[DE84-014906] N84-33241
ENERGY POLICY
Stable density stratification solar pond
[NASA-CASE-NPO-15419-2] N84-32910
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912

ENERGY SPECTRA
A study of the temporal and spectral characteristics of gamma ray bursts N84-33331
ENERGY STORAGE
Characterization of physiochemical properties of polymeric and electrochemical materials for aerospace flight [NASA-CR-175258] N84-32534
Negative electrode catalyst for the iron-chromium REDOX energy storage system [NASA-CASE-LEW-14026-1] N84-32909
Technology Base Research Project for Electrochemical Energy Storage [DE84-013877] N84-32930
ENERGY TECHNOLOGY
Summary status of advanced water electrolysis and hydrogen storage/transport research and development [DE84-012908] N84-32456
Refueling considerations for liquid-hydrogen fueled vehicles [DE84-012823] N84-32557
Advancement of developmental technology for pulse combustion applications [PB84-215268] N84-32576
Effects of expiration of the Federal energy tax credit on the National Photovoltaics Program [NASA-CR-173900] N84-33299
ENERGY TRANSFER
Spot heating calculation for a heavy ion driven high temperature experiment [DE84-013879] N84-33159
Atomic resonance and scattering N84-33339
ENGINE DESIGN
Energy efficient engine component development and integration program [NASA-CR-173684] N84-32389
SEAMOPT: Sterling engine optimization code [DE84-012098] N84-32840
Automotive Stirling Engine Development Program. kESD summary report [NASA-CR-174674] N84-33307
ENGINE INLETS
Numerical solutions of acoustic wave propagation problems using Euler computations [NASA-CR-172434] N84-33112
ENGINE MONITORING INSTRUMENTS
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5 [NASA-CR-171128] N84-32949
ENGINE PARTS
Engine wear with methanol fuel in a nitrogen-free environment [AD-A143530] N84-32833
ENGINE TESTS
Energy efficient engine component development and integration program [NASA-CR-173684] N84-32389
ENGINEERING
Determination of factors affecting performance and productivity in an engineering/design environment [AD-A143315] N84-33252
ENGINES
Engine wear with methanol fuel in a nitrogen-free environment [AD-A143530] N84-32833
SEAMOPT: Sterling engine optimization code [DE84-012098] N84-32840
ENTHALPY
Determination of thermodynamic characteristics of the barium dissolution process in liquid iron [BLL-M-35634-(5828.4)] N84-32481
Heat-of-mixing experiments for liquefied gases [PB84-215094] N84-32560
Computer simulation of the heavy-duty turbo-compounded diesel cycle for studies of engine efficiency and performance [NASA-CR-174755] N84-33306
ENTIRE FUNCTIONS
The growth of plurisubharmonic functions in infinite domain N84-33033
An application of fine potential theory to prove a Phragmen Lindeloef theorem N84-33043
ENTRAINMENT
Static thrust augmentation of rocket motors by air entrainment [AD-A143179] N84-32430
ENTROPY
Seasonal precipitation forecasting with a 6 to 7 month lead time in the Pacific Northwest using an information theoretic model [PB84-207018] N84-32979
ENTROPY (STATISTICS)
An entropy maximum principle and instantaneous failure statistics [AD-A143299] N84-32851
ENVIRONMENT EFFECTS
The climatic impact of volcanic activity N84-32963
Noise measurement flight test: Data-analyses Aerospatiale SA-365N Dauphin 2 helicopter [AD-A143229] N84-33151
ENVIRONMENT MANAGEMENT
Design, test, and evaluation of an Air Force environmental model and data exchange [AD-A143226] N84-33060
ENVIRONMENT MODELS
Two-dimensional finite amplitude mountain waves in the presence of moisture N84-32947
ENVIRONMENTAL MONITORING
Satellite activities of NOAA, 1983 N84-32408
Field surveys of carbon monoxide in commercial settings using personal exposure monitors [PB84-211291] N84-32797
National environmental monitoring [GPO-26-166] N84-32933
Locating and estimating air emissions from sources of acrylonitrile [PB84-200609] N84-32934
Locating and estimating air emissions from sources of carbon tetrachloride [PB84-200625] N84-32936
ENVIRONMENTAL TESTS
Stress corrosion cracking of austenitic stainless steels in sea water: An investigation of test methods [BLL-RISLEY-TRANS-4568-(9091.9)] N84-32478
Qualification testing and electrical measurement experience: A manufacturer's view N84-32705
ENVIRONMENTS
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers [AD-A143318] N84-32655
Determination of factors affecting performance and productivity in an engineering/design environment [AD-A143315] N84-33252
EPITAXY
Epitaxial crystallization in the Te-HgTe-CdTe system [CSIR-TRANS-1745] N84-33206
Electroding of multi-layered epitaxial structures [AD-D011137] N84-33209
Physical properties of CdTe films grown by hotwall and molecular beam techniques [AD-A143160] N84-33214
Electron localization and superconductivity of very thin epitaxially grown ag films on ge(001) [AD-A143469] N84-33224
Process for the epitaxial deposition of III-V compounds utilizing a binary alloy as the metallic source [AD-D011097] N84-33229
EPOXY COMPOUNDS
Cure reactions, network structure and mechanical response of diaminodiphenyl sulfone cured tetraglycidyl 4,4'diaminodiphenyl methane [DE84-012607] N84-32548
EPOXY MATRIX COMPOSITES
Probabilistic models of the stress-rupture of composite materials: Summary [DE84-013477] N84-32441
EQUATIONS OF MOTION
Linearized dynamical model for the NASA/IEEE SCOLE configuration [NASA-CR-172394] N84-32423
Adone parameters, beam structure and luminosity — particle acceleration [DE84-012866] N84-33154
EROSION
Chemical vapor deposition of erosion resistant TiB-2 coatings [DE84-012351] N84-32518
Characterization of erosion of metallic materials under cavitation attack in a mineral oil [NASA-TP-2368] N84-32625
Historical and projected shoreline changes: Ocean City and north Assateague Island, Maryland [PB84-190206] N84-32987
ERROR ANALYSIS
A strategy for successful deep space information transmission in bad weather N84-32635
Earth orientation effects on mobile VLBI baselines N84-32642
A theory of error-based testing [AD-A143533] N84-33081
Graphical error analysis [BMFT-FB-T-84-081] N84-33093
On accuracy conditions for the numerical computation of waves [NASA-CR-172433] N84-33111
ERROR CORRECTING CODES
Error-trellis syndrome decoding techniques for convolutional codes N84-32633
Algorithms for error localization of discrete data [DE84-014417] N84-33089
ERROR DETECTION CODES
Algorithms for error localization of discrete data [DE84-014417] N84-33089
ERRORS
Correlational estimation of parameters of solid state microwave devices N84-32609
Test procedures and design methods for reliable large scale integrated circuits and systems [AD-A143324] N84-33061
ESCAPE
A research study of the assessment of escape impairment by irritant combustion gases in postcrash aircraft fires [FAA-CT-84-16] N84-32366
ESTIMATES
Locating and estimating air emissions from sources of chloroform [PB84-200617] N84-32935
ETCHING
Method for making Josephson junctions with contamination-free interfaces utilizing a ZNO contact insulator [AD-D011057] N84-32871
Wide spectrum antireflective coating for laser fusion systems [DE84-013211] N84-32614
ETHYL ALCOHOL
Occupational Medicine Relevant to Aviation Medicine [AGARD-CP-341] N84-33011
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33015
ETHYLENE OXIDE
Electrical and differential scanning calorimetry studies of poly(ethylene oxide) complexed with alkaline earth thiocyanates [AD-A143198] N84-32449
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers [AD-A143202] N84-32451
EULER EQUATIONS OF MOTION
Simplifications in the simulation of mechanisms containing flexible members N84-32855
Numerical solutions of acoustic wave propagation problems using Euler computations [NASA-CR-172434] N84-33112
EULER-LAGRANGE EQUATION
Linearized dynamical model for the NASA/IEEE SCOLE configuration [NASA-CR-172394] N84-32423
EUROPE
Physics in Europe: A data file of selected research [AD-A143428] N84-33289
EUROPEAN COMMUNICATIONS SATELLITE
A transportable satellite Earth station [BBC-RD-1984/8] N84-32614
EUROPEAN SPACE AGENCY
A description of the ground segment of CNES, ESA, and TELESAT [INPE-2984-NTE/211] N84-32407
EVAPORATION
A theoretical and experimental study of turbulent evaporating sprays [NASA-CR-174760] N84-32390
Heat transfer, fluid flow and element vaporization in laser welding [DE84-011783] N84-32839
EVAPORATORS
Multi-leg heat pipe evaporator [NASA-CASE-MSC-20812-1] N84-32748
EXCIMER LASERS
Evaluation of bidirectionally conducting thyratrons for pulsed excimer lasers [DE84-013890] N84-32618
EXCITATION
Beam cavity coupling impedance [DE84-014084] N84-32682
Measurement of the transverse mode excitation in the stimulated emission of the ACO free electron laser [AD-A143449] N84-32808
EXHAUST EMISSION
Locating and estimating air emissions from sources of acrylonitrile [PB84-200609] N84-32934
Computer simulation of the heavy-duty turbo-compounded diesel cycle for studies of engine efficiency and performance [NASA-CR-174755] N84-33306
EXHAUST GASES
Advancement of developmental technology for pulse combustion applications [PB84-215268] N84-32576
EXHAUST NOZZLES
Axisymmetric thrust augmenting ejector with discrete primary air slot nozzles [AD-D011129] N84-32386

Thrust Reverser/Exhaust nozzle assembly for a gas turbine engine
[AD-D011101] N84-32392

EXISTENCE
The well-posedness of the Kuramoto-Sivashinsky equation
[NASA-CR-172431] N84-33053

EXOBIOLOGY
Publications of the NASA space biology program for 1980 - 1984 — bibliographies
[NASA-TM-86957] N84-32990
Aerospace Medicine and Biology: A continuing bibliography with indexes
[NASA-SP-7011(262)] N84-33003

EXPANSION
Altering the volumetric expansion ratio of a Lysholm helical screw expander
[DE84-013695] N84-32573
Empirical modeling of a Lysholm helical screw expander
[DE84-013694] N84-32574

EXPERIMENT DESIGN
A comparative study in the animal of the toxicity of the combustion products of diverse materials N84-33015
Asymptotic relative efficiencies of the rank transformation procedure in randomized complete block designs
[DE84-010600] N84-33134

EXPLOSIVES
3,5,5-trinitro-3-azaheptane-1,7-diol and a method of synthesis
[AD-D011132] N84-32555

EXPOSURE
Visual function and the definition of thresholds for exposure to laser radiation N84-33019

EXTRAPOLATION
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010

EXTRUDING
Low cost thermal protection system processing
[AD-D011142] N84-32434

EYE (ANATOMY)
Eye safe laser transmitter
[AD-D011145] N84-32779
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Visual function and the definition of thresholds for exposure to laser radiation N84-33019

F

F-4 AIRCRAFT
Aircraft accident report. Midair collision: McDonnell-Douglas F-4C Beech D-55 Baron, Cherry Point, North Carolina, 9 January 1983
[PB84-910407] N84-32368

F-16 AIRCRAFT
Handling of hydrazine in the Royal Danish Air Force N84-33014

F-106 AIRCRAFT
Lightning swept-stroke attachment patterns and flight conditions for storm hazards 1981
[NASA-TM-86279] N84-32365

FABRICATION
Method for making Josephson junctions with contamination-free interfaces utilizing a ZNO contact insulator
[AD-D011057] N84-32671
Three-dimensional circuit layouts
[AD-A143430] N84-32713
CdS/CuInSe2 heterojunction cell research
[DE84-004508] N84-32926
High-efficiency multi-colored photovoltaic cells
[PB84-200575] N84-32932
Method for fabricating MNOS structures utilizing hydrogen ion implantation
[AD-D011123] N84-33208
Submicron structures technology and research N84-33353

FACTORIZATION
High-order sparse factorization methods for elliptic boundary value problems
[DE84-012582] N84-33122

FAILURE
Laboratory experience with voltage breakdown N84-32693
Breakdown of organic insulators N84-32694
An entropy maximum principle and instantaneous failure statistics
[AD-A143299] N84-32851

FAILURE ANALYSIS
Structural performance of orthogonal tetrahedral truss Space-Station configurations
[NASA-TM-86260] N84-32422
Failure analysis of a graphite/epoxy laminate subjected to bolt bearing loads
[NASA-TM-86297] N84-32436
Hygrothermal effects on mechanical behavior of graphite/epoxy laminates beyond initial failure
[NASA-TM-86001] N84-32438
Probabilistic models of the stress-rupture of composite materials: Summary
[DE84-013477] N84-32441
Development of shearography for nondestructive testing of highway structure
[PB84-187244] N84-32577
Hot-spot heating in central-station arrays N84-32666
Hot-spot investigations of utility scale panel configurations N84-32667
Materials testing of the IUS techroll seal material
[NASA-TM-86462] N84-32629
Computer system for fiber creep testing
[DE84-014453] N84-32885

FAILURE MODES
Materials testing of the IUS techroll seal material
[NASA-TM-86462] N84-32629

FALLING SPHERES
Quick Deployment Vehicle (QDV)
[AD-D011060] N84-32563
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers
[AD-A143316] N84-32655

FAR FIELDS
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket
[AD-A143266] N84-32653
The correction of aberrations computed in the aperture plane of multifrequency microwave radiometer antennas
[NASA-TM-86090] N84-32679
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies
[AD-A143507] N84-32992
Time development of Cerenkov radiation
[AD-A143225] N84-33155

FAR ULTRAVIOLET RADIATION
Polynominal grating
[AD-D011090] N84-33186

FAST FOURIER TRANSFORMATIONS
Phase-only optical filter for use in an optical correlation system
[AD-D011093] N84-33187

FATIGUE (MATERIALS)
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue
[NASA-CR-174666] N84-32503
On the mechanics of fatigue crack growth due to contact loading N84-32859
Retardation analytical model to extend service life
[NASA-CR-173891] N84-32862
Fatigue behavior of longitudinal transverse stiffener intersection
[PB84-202092] N84-32887

FATIGUE LIFE
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue
[NASA-CR-174666] N84-32503
Fatigue behavior of longitudinal transverse stiffener intersection
[PB84-202092] N84-32887
Fatigue behavior of welded joints subjected to variable amplitude stresses
[PB84-207620] N84-32888

FATIGUE TESTS
The need for biaxial fatigue testing at A.R.L.
[AD-A143203] N84-32878
Fatigue behavior of longitudinal transverse stiffener intersection
[PB84-202092] N84-32887

FAULT TOLERANCE
Test procedures and design methods for reliable large scale integrated circuits and systems
[AD-A143324] N84-33061
Extending binary Byzantine agreement to multivalued Byzantine agreement
[AD-A143424] N84-33077

FEASIBILITY ANALYSIS
Shuttle detached spacecraft
[AD-A143320] N84-32417
Development of shearography for nondestructive testing of highway structure
[PB84-187244] N84-32577
Dynamic testing of NOVA laser structural systems. The north side of Spaceframe Tower
[DE84-014830] N84-32816

FEDERAL BUDGETS
Analysis of benefits realized from multiyear contracting for the Black Hawk helicopter
[AD-A143485] N84-33254
The 1985 NASA authorization, volume 2
[GPO-34-202] N84-33301
Oversight on the Federal Aviation Administration fiscal year 1985 research, engineering and development budget request
[GPO-34-924] N84-33302

FEEDBACK
Feedback systems and simultaneous design
[AD-A143547] N84-33102

FEEDBACK CONTROL
Research on output feedback control of systems with ill-conditioned dynamics
[NASA-CR-173921] N84-33071
Controller technique of compensation figured in an active control scheme on the accumulated effects of deviation in the modeling
[INPE-2987-TDL/152] N84-33100
Frequency response design methods for large scale systems
[DE84-013111] N84-33103

FEEDERS
Special features of the formation of a bed of polydispersed free-flowing materials
[BLL-M-35674-(5828.4)] N84-32747

FEMALES
NASA Ames summary high school apprenticeship research program, 1983 research papers
[NASA-TM-85931] N84-33365

FERRITIC STAINLESS STEELS
Effect of precipitated austenite on the fracture of a ferritic cryogenic steel
[DE84-014604] N84-32521
Ion bombardment damage in a modified Fe-9Cr-1Mo steel
[DE84-014288] N84-32522
Low-chromium heat-resisting ferritic alloys strengthened by the Chi Phase
[PB84-199041] N84-32524

FERROFLUIDS
Linear motion valve
[NASA-CASE-MSC-20148-1] N84-32823

FERROMAGNETIC MATERIALS
Anomalous surface impedance in reentrant ferromagnetic superconductors
[DE84-012634] N84-33230

FERROMAGNETISM
Thermomagnetic properties of GdPd
[DE84-009991] N84-32515

FIBER OPTICS
Optical fiber termination and splicing techniques
[DE84-013919] N84-32572
Peculiarities in construction of optical receivers for digital fiber-optic communication lines N84-32596
Signal waveform detector using synthetic FM demodulation
[AD-D011055] N84-32618
Fiber optic magnetometer for the detection of dc magnetic fields without hysteretic ambiguity
[AD-D011085] N84-32794
West Europe report: Science and technology
[JPRS-WST-84-030] N84-33141
Sweden: Optical fiber carries laser power for welding N84-33144
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
Low loss splicing method for single-mode optical fiber
[NASA-CASE-NPO-16294-1] N84-33179
Definition, analysis and development of an optical data distribution network for integrated avionics and control systems. Part 2: Component development and system integration
[NASA-CR-172429] N84-33181
Investigation of optical fibers for nonlinear optics
[AD-A143565] N84-33185
Communication networks N84-33356

FIBER ORIENTATION
Numerical techniques for the prediction of flow induced orientation N84-32743

FIBER REINFORCED COMPOSITES
Method of making compartmented, filament wound, one-piece aircraft fuel tanks
[AD-D011144] N84-32376
Probabilistic models of the stress-rupture of composite materials: Summary
[DE84-013477] N84-32441

FIBERS
Method for forming fibrous silicon carbide insulating material
[DE84-014658] N84-32442
Computer system for fiber creep testing
[DE84-014453] N84-32885

Investigation of optical fibers for nonlinear optics
[AD-A143565] N84-33185

FIELD EFFECT TRANSISTORS
Universal control grid modulator
[AD-D011108] N84-32672
A study of the high frequency limitations of series resonant converters
[NASA-CR-173868] N84-32678
FET charge sensor and voltage probe
[NASA-CASE-NPO-16045-1] N84-33211
Submicron structures technology and research N84-33353

FIELD THEORY (ALGEBRA)
Infinitesimal L-classes of a group of algebraic numbers N84-33039
Inelastic strong interactions at high energies
[DE84-013647] N84-33170

FIELD THEORY (PHYSICS)
Axions, neutrinos and strings: The formation of structure in an SO(10) universe
[NASA-TM-86139] N84-33317

FILAMENT WINDING
Method of making compartmented, filament wound, one-piece aircraft fuel tanks
[AD-D011144] N84-32376

FILAMENTS
Method of making compartmented, filament wound, one-piece aircraft fuel tanks
[AD-D011144] N84-32376

FILE MAINTENANCE (COMPUTERS)
The design and usage of the new data management features in NASTRAN N84-32866
Updating replicated files in real time distributed processing systems N84-33264
Physics in Europe: A data file of selected research
[AD-A143428] N84-33289

FILES
Physics in Europe: A data file of selected research
[AD-A143428] N84-33289

FINANCE
Voluntary accounting systems for a small air carrier: Revenues, financial and traffic statistics
[PB84-210996] N84-32369

FINITE DIFFERENCE THEORY
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85980] N84-32358
A two-fluid instability
[DE84-012899] N84-32764
Ekman boundary conditions for numerical models of centrifuge flows
[DE84-013578] N84-32765
Turbine blade and vane heat flux sensor development, phase 1
[NASA-CR-168297] N84-32790
Quasiconformal mappings and grid generation
[NASA-CR-173920] N84-33105
Second- and third-order upwind difference schemes for hyperbolic conservation laws
[NASA-TM-85959] N84-33106
Stability analysis of finite difference schemes for hyperbolic systems, and problems in applied and computational linear algebra
[AD-A143537] N84-33119
Numerical diffraction by a uniform grid
[DE84-012861] N84-33121

FINITE ELEMENT METHOD
A simple rectangular element for 2-dimensional analysis of laminated composites
[NASA-TM-86291] N84-32439
A finite element implementation of the dual variable method for the Navier-Stokes equations N84-32746
On the finite element approximation of the stream function-vorticity equations
[AD-A143506] N84-32758
Computational fluid dynamics at the ICMA (Institute of Computational Mathematics and Applications)
[AD-A143510] N84-32759
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
Twelfth NASTRAN Users' Colloquium
[NASA-CP-2328] N84-32864
Accuracy of three dimensional solid finite elements N84-32867
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874
On accuracy conditions for the numerical computation of waves
[NASA-CR-172433] N84-33111
Numerical diffraction by a uniform grid
[DE84-012861] N84-33121

FIRES
A research study of the assessment of escape impairment by irritant combustion gases in postcrash aircraft fires
[FAA-CT-84-16] N84-32366
A comparative study in the animal of the toxicity of the combustion products of diverse materials N84-33015

FLAME PROPAGATION
Conditional velocity statistics in premixed CH-4-air and C-2H-4-air turbulent flames
[DE84-012257] N84-32464
Nonlinear burning stability of solid propellants
[AD-A143573] N84-32554
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage
[DE84-012234] N84-32796

FLAME SPRAYING
Intermodulation product levels in flame-sprayed materials N84-32629

FLAME STABILITY
Nonlinear burning stability of solid propellants
[AD-A143573] N84-32554

FLAMMABILITY
Synthesis and characterization of phosphorus-containing polyamides and copolyamides based on 1methyl)-2,4- and -2,6-diaminobenzenes
[NASA-TM-85877] N84-32431

FLASH POINT
Molecular beam mass spectrometer sampling of flash ignited combustion
[DE84-006771] N84-32459

FLAT PLATES
Is structural interface standardization beneficial? N84-32702
Qualification tests and electrical measurements: Practice and problems N84-32703
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
Flate-plate photovoltaic power systems handbook for Federal agencies
[NASA-CR-173901] N84-32921

FLEXIBILITY
Flexible, resilient anti-contamination baffle
[AD-D011111] N84-32421

FLEXIBLE BODIES
Parameter estimation for the Euler-Bernoulli-beam
[NASA-CR-172417] N84-33107

FLEXIBLE SPACECRAFT
Linearized dynamical model for the NASA/IEEE SCOLE configuration
[NASA-CR-172394] N84-32423

FLIGHT CHARACTERISTICS
NASA rotor system research aircraft flight-test data report: Helicopter and compound configuration
[NASA-TM-85843] N84-32381
Software conversion history of the Flight Dynamics System (FDS)
[NASA-CR-175257] N84-32404

FLIGHT CONTROL
A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers
[NASA-TM-85873] N84-32393
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173880] N84-32395
Analysis, testing, and evaluation of faulted and unfaulted Wye, Delta, and open Delta connected electromechanical actuators
[NASA-CR-171808] N84-32707

FLIGHT CREWS
The feasibility, practicality and utility of P-3 inflight refueling
[AD-A143419] N84-32362
Visual information transfer. 1: Assessment of specific information needs. 2: The effects of degraded motion feedback. 3: Parameters of appropriate instrument scanning behavior
[NASA-CR-173913] N84-33020

FLIGHT PATHS
Minimum-fuel, 3-dimensional flightpath guidance of transfer jets
[NASA-TP-2326] N84-32394

FLIGHT SIMULATION
JT15D simulated flight data evaluation
[NASA-CR-172322] N84-32387
Future requirements for airborne simulation
[AGARD-AR-168] N84-32401
Visual information transfer. 1: Assessment of specific information needs. 2: The effects of degraded motion feedback. 3: Parameters of appropriate instrument scanning behavior
[NASA-CR-173913] N84-33020
Flight systems raster graphics software reference manual
[ARL-SYS-TM-72] N84-33072
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 1: Test nozzles and acoustic data
[NASA-CR-168234-VOL-1] N84-33148

FLIGHT SIMULATORS
Future requirements for airborne simulation
[AGARD-AR-168] N84-32401

FLIGHT TESTS
Lightning swept-stroke attachment patterns and flight conditions for storm hazards 1981
[NASA-TM-86279] N84-32365
An investigation of a new flight test method for measuring the performance of general aviation aircraft N84-32075
NASA rotor system research aircraft flight-test data report: Helicopter and compound configuration
[NASA-TM-85843] N84-32381
Air data position-error calibration using state reconstruction techniques
[NASA-TM-86029] N84-32384
A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers
[NASA-TM-85873] N84-32393
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173880] N84-32395

FLOQUET THEOREM
Analysis of parametrically excited large vibration systems
[AD-A143283] N84-32879

FLOW DISTRIBUTION
Summary of recent NASA propeller research
[NASA-TM-83733] N84-32344
Improvements in the accuracy and stability of algorithms for the small-disturbance and full-potential equations applied to transonic flows
[NASA-TM-85970] N84-32350
Fuselage and nozzle pressure distributions of a 1/12-scale F-15 propulsion model at transonic speeds. Effect of fuselage modifications and nozzle variables
[NASA-TP-2333] N84-32354
Investigation of the three-dimensional flow field within a transonic fan rotor: Experiment and analysis
[NASA-TM-83739] N84-32357
A study of leeside flow field heat transfer on Shuttle Orbiter configuration
[NASA-CR-172362] N84-32410

FLOW VELOCITY
Air data position-error calibration using state reconstruction techniques
[NASA-TM-86029] N84-32384
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
Effects of system and geometrical parameters on the flow of Class-B solids in overflow standpipes
[DE84-013948] N84-32762
High-efficiency particulate air filter behavior at high-speed flows
[DE84-014137] N84-32769
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 2: Laser velocimeter data
[NASA-CR-168234-VOL-2] N84-33149

FLOW VISUALIZATION
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 3: Shadowgraph photos and facility description
[NASA-CR-168234-VOL-3] N84-33150

FLOWMETERS
Construction and evaluation of a flow test stand
[PB84-201581] N84-32906

FLUID DYNAMICS
An integral equation for the solution of nonlinear wave equations N84-32347
Mass transfer from a circular cylinder: Effects of flow unsteadiness and slight nonuniformities
[NASA-CR-174759] N84-32751
Large HAWT (Horizontal-Axis Wind Turbine) wake measurement and analysis
[DE84-013269] N84-32772

FLUID FLOW
Effects of system and geometrical parameters on the flow of Class-B solids in overflow standpipes
[DE84-013948] N84-32762
High-efficiency particulate air filter behavior at high-speed flows
[DE84-014137] N84-32769

Heat transfer, fluid flow and element vaporization in laser welding
[DE84-011763] N84-32839
Aggradation and degradation at alluvial-channel beds
[PB84-201557] N84-32905
Construction and evaluation of a flow test stand
[PB84-201581] N84-32906
Experimental and model transport and diffusion studies in complex terrain with emphasis on tracer studies
[DE84-013076] N84-32975

FLUID JETS
A two-fluid instability
[DE84-012899] N84-32764

FLUID MECHANICS
Investigation of the three-dimensional flow field within a transonic fan rotor: Experiment and analysis
[NASA-TM-83730] N84-32357
Manipulation of the mixing process between streams of different velocity and temperature in the presence of pressure gradient
[AD-A143467] N84-32757
Wind loading on solar concentrators: Some general considerations
[NASA-CR-173896] N84-32915
A nomographic methodology for use in performance trade-off studies of parabolic dish solar power modules
[NASA-CR-173908] N84-32918

FLUIDIZED BED PROCESSORS
Adsorbent regenerator
[DE84-012969] N84-32468

FLUIDS
Comparison between two Lysholm engines
[DE84-013696] N84-32571

FLUORESCENCE
Magnetic fluorescent lamp
[DE84-014231] N84-32740
Chemical reactions, radiative and energy transfer processes of important atmospheric species
[AD-A143264] N84-33156

FLUOROCARBONS
Locating and estimating air emissions from sources of chloroform
[PB84-200617] N84-32935

FLUTTER ANALYSIS
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353

FLUX (RATE)
Pulse driver for flux gate magnetometer
[AD-D011053] N84-32774

FLYING PLATFORMS
Shuttle detached spacecraft
[AD-A143320] N84-32417

FLYWHEELS
Bi-directional control system for energy flow in a solar powered flywheel
[NASA-CASE-MFS-25978-1] N84-32913

FOAMS
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535

FOCUSING
Focusing twist reflector for electron-cyclotron resonance heating in the Tandem Mirror Experiment-upgrade
[DE84-012954] N84-32663

FOG
Warm fog dissipation using large volume water sprays
[NASA-CASE-MFS-25962-1] N84-32396

FOLDING STRUCTURES
Foldable self-erecting joint — space erectable structures
[NASA-CASE-MSC-20635-1] N84-32424

FOOD PROCESSING
Microbiology and food program N84-32999
Workshop on Systems Analysis
[PB84-194661] N84-33138

FORECASTING
Normal modes of the NCAR (National Center for Atmospheric Research) Community Forecast Model (CFM)
[PB84-191220] N84-33094
Future of high energy physics
[DE84-013513] N84-33165

FOREIGN TRADE
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents. Appendix
[PB84-196997] N84-33255
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents
[PB84-197003] N84-33256

FORM FACTORS
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-dadron systems, hadron form factors, and Dirac particles
[DE84-012971] N84-33161

FORMAT
Optional stopping performance under graphic and numeric CRT formatting
[AD-A143274] N84-32712
Notes for medical catalogers, 1983
[PB84-195874] N84-33296

FORMULAS (MATHEMATICS)
Some practical Runge-Kutta formulas
[DE84-013539] N84-33123

FORTRAN
Numerical calculations of the function of the static receptivity of electrons in metals
[BLL-M-35640-(5828.4)] N84-32480

FOUNDATIONS
Investigation and rehabilitation to extend service life of DSS-13 antenna concrete foundation N84-32637

FOURIER ANALYSIS
The exponential accuracy of Fourier and Tchebyshev differencing methods
[NASA-CR-172435] N84-33106

FOURIER SERIES
Horizontal cylindrical vessels supported by saddles subjected to vertical and lateral force fields N84-32858

FOURIER TRANSFORMATION
The Fourier Plancherel transform for Lie groups. 2: Nilpotent groups N84-33026
Radial distribution function as an analysis technique
[DE84-013242] N84-33235

FRACTURE MECHANICS
Statistics of fracture of composite materials under multiaxial loading N84-32433
Weldability of steels: Study of cracking and methods of examination
[BLL-RISLEY-TRANS-4519-(9091.9)] N84-32475
Textile ballistic performance (data base)
[AD-A143249] N84-32541
Application of elastic wave scattering theory to the detection and characterization of flaws in structural materials
[DE84-013729] N84-32852
On the mechanics of fatigue crack growth due to contact loading N84-32859
Opening of an interface flaw in a layered elastic half-plane under compressive loading
[NASA-TM-86282] N84-32877
The need for biaxial fatigue testing at A.R.L.
[AD-A143203] N84-32878

FRACTURE STRENGTH
Thermal shock: High temperature high energy rate testing
[DE84-014147] N84-32886

FRACTURING
Effect of precipitated austenite on the fracture of a ferritic cryogenic steel
[DE84-014604] N84-32521
Diagensis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938

FRAMES
Nonlinear elastic stability analysis of plane frames N84-32853

FREE ELECTRON LASERS
Measurement of the transverse mode excitation in the stimulated emission of the ACO free electron laser
[AD-A143449] N84-32808

FREE ELECTRONS
Plasma dynamics N84-33354

FREE RADICALS
Chemistry of energetic fragments: Hypovalent radicals
[AD-A143269] N84-32453

FREEZING
Liquid and solid phase compositions in a partially frozen JP-5 fuel low in n-alkanes
[AD-A143390] N84-32553
Resistance of microorganisms from mesosphere to periodic freezing-thawing N84-33001

FREQUENCIES
Period-doubling 2-torus state in a convecting He-3-superfluid He-4 solution
[DE84-009985] N84-33243

FREQUENCY ASSIGNMENT
Spectrum resource assessment in the 162-174 MHz frequency band — land mobile communications
[PB84-210244] N84-32667

FREQUENCY CONTROL
A study on accurate frequency-control of semiconductor lasers N84-32566

FREQUENCY CONVERTERS
Inductive transducer for displacement-to-frequency conversion N84-32594
Frequency conversion in photomultiplier during interaction of photoelectron beam and electric field in heterodyne N84-32599
Millimetric wave frequency converter using Gunn-effect diode N84-32607

FREQUENCY DISTRIBUTION
Radio frequency distribution assembly
[AD-A143575] N84-32658
Wind shear for large wind turbine generators at selected tall tower sites
[DE84-011790] N84-32974

FREQUENCY MODULATION
Spectrum resource assessment in the 162-174 MHz frequency band — land mobile communications
[PB84-210244] N84-32667

FREQUENCY RESPONSE
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 6
[NASA-CR-171126] N84-32780
Frequency response design methods for large scale systems
[DE84-013111] N84-33103

FREQUENCY STABILITY
Stable asynchronous two-frequency oscillations in Gunn-effect diode with open resonator structure N84-32611
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32806

FRESNEL LENSES
Concentrating photovoltaic technology
[DE84-012275] N84-32931

FRICTION
Microstructure and surface chemistry of amorphous alloys important to their friction and wear behavior
[NASA-TM-83762] N84-32508
The friction behavior of semiconductors Si and GaAs in contact with pure metals
[NASA-TM-83779] N84-32531
Friction and wear studies of liquid metal wetted, metallic fiber brushes
[AD-A143473] N84-32831

FRICTION REDUCTION
The effects of porous material on microbubble skin friction reduction
[AD-A143401] N84-32756

FROST
The severity of the Brazilian freeze of 1981 as monitored in real time by satellite
[INPE-2586-PRE/234] N84-32967

FUEL CELLS
Molten carbonate fuel cell performance model update
[DE84-012932] N84-32733
Fuel cell power systems for Navy applications
[AD-A143402] N84-32923
Technology Base Research Project for Electrochemical Energy Storage
[DE84-013877] N84-32930

FUEL COMBUSTION
A comprehensive chemical kinetic reaction mechanism for the oxidation of n-butane
[DE84-005739] N84-32467
Engine wear with methanol fuel in a nitrogen-free environment
[AD-A143530] N84-32833
Experimental and modeling study of engine knock
[DE84-006134] N84-32844

FUEL CONSUMPTION
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173880] N84-32395
Swedish research in high-temperature ceramics, superalloys N84-33142

FUEL CORROSION
Engine wear with methanol fuel in a nitrogen-free environment
[AD-A143530] N84-32833

FUEL GAGES
Volumetric fuel quantity gauge
[NASA-CASE-LAR-13147-1] N84-32787

FUEL INJECTION
Low heat loss laser combustion chamber
[AD-D011107] N84-32799
Fuel injection device and method
[DE84-014320] N84-32846

FUEL PRODUCTION
Review of solar fuel-producing quantum conversion processes
[NASA-CR-173904] N84-32916

FUEL SYSTEMS
Refueling considerations for liquid-hydrogen fueled vehicles
[DE84-012623] N84-32557
Special features of the formation of a bed of polydispersed free-flowing materials
[BLL-M-35674-(5828.4)] N84-32747

Transverse flow CW atomic iodine laser system [AD-D011098] N84-32810

FUEL TANKS
Method of making compartmented, filament wound, one-piece aircraft fuel tanks [AD-D011144] N84-32376
Volumetric fuel quantity gauge [NASA-CASE-LAR-13147-1] N84-32787

FUNCTION SPACE
Annals of the Fourier Institute, volume 34, no. 1 [ISSN-0373-0956] N84-33025
On the boundary limits of harmonic functions with gradient in L sup p N84-33030
The Levi problem for cohomology classes N84-33032
On the closure of spaces of sums of ridge functions and the range of the X-ray transform N84-33035
Annals of the Fourier Institute, volume 34, no. 2 [ISSN-0373-0956] N84-33038
On the A-integrability of singular integral transforms N84-33042
Infinitesmal deformation of locally symmetrical Riemann spaces. 2: Blaschke's infinitesimal conjecture for complex projective space N84-33049
Serre's spectral sequence and homotopy N84-33050

FUNCTIONAL DESIGN SPECIFICATIONS
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 2: Design and development [NASA-CR-175262] N84-32647

FURNACES
High temperature metallic recuperator [PB84-207869] N84-32575

FUSELAGES
Fuselage and nozzle pressure distributions of a 1/12-scale F-15 propulsion model at transonic speeds. Effect of fuselage modifications and nozzle variables [NASA-TP-2333] N84-32354

FUSION REACTORS
Wide spectrum antireflective coating for laser fusion systems [DE84-013211] N84-32814
Synergistic effects in plasma surface interactions [DE84-012346] N84-33199

FUZZY SETS
Degrees of adjacency or surroundedness [AD-A143528] N84-33118
Quantitative treatment of fuzzy relations in the process of allocating resources to R and D projects [INPE-2761-PRE/336] N84-33251

G

GADOLINIUM ALLOYS
Thermomagnetic properties of GdPd [DE84-009991] N84-32515

GALACTIC RADIATION
Identification of gamma-ray lines observed from SS433 [DE84-013829] N84-33335

GALILEO PROJECT
A high energy stage for the National Space Transporation System [NASA-TM-83795] N84-32411

GALLIUM ALLOYS
Preparation of high purity Ga(X)In(1-x) by the VPE-hydride method with a gallium-indium alloy source [AD-A143275] N84-33218

GALLIUM ARSENIDES
The friction behavior of semiconductors Si and GaAs in contact with pure metals [NASA-TM-83779] N84-32531
High-speed thyristors on weakly doped GaAs N84-32600
Schottky barrier and homojunction gallium arsenide solar cells N84-32907
Preparation of high purity Ga(X)In(1-x) by the VPE-hydride method with a gallium-indium alloy source [AD-A143275] N84-33218
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition [AD-A143361] N84-33219
Quantum structure of adsorbates on semiconductor surfaces [AD-A143465] N84-33223
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors [AD-A143551] N84-33225
Quantum transport in low dimensional disordered systems N84-33347

GALLIUM COMPOUNDS
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition [AD-A143361] N84-33219

GAME THEORY
Rand's experience in applying artificial intelligence techniques to strategic-level military-political war gaming [P-6977] N84-33137

GAMMA RAY BURSTS
A study of the temporal and spectral characteristics of gamma ray bursts N84-33331
Three precise gamma-ray burst source locations [NASA-TM-86132] N84-33332

GAMMA RAY SPECTRA
Identification of gamma-ray lines observed from SS433 [DE84-013829] N84-33335

GAMMA RAY SPECTROMETERS
Calibration and performance of a high-resolution gamma-spectroscopy system [DE84-012792] N84-32462
Gamma-ray spectroscopy of hypernuclei [DE84-013142] N84-33162

GAMMA RAYS
A study of the temporal and spectral characteristics of gamma ray bursts N84-33331
Identification of gamma-ray lines observed from SS433 [DE84-013829] N84-33335

GANYMEDE
A geographic comparison of selected large-scale planetary surface features [NASA-TM-86147] N84-33320

GAS ANALYSIS
Mathematical model of electrostatic precipitation (revision 3). Volume 1: Modeling and programming [PB84-212679] N84-32469
Effect of feed gas trace components on the SRC-1 hydrogen purification unit [DE84-012975] N84-32556
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers [AD-A143319] N84-32959

GAS CHROMATOGRAPHY
Gas chromatographic analysis of nitrogen [BLL-RISLEY-TRANS-4563-(9091.9)] N84-32443

GAS DISCHARGE TUBES
High-intensity discharge (HID) solid-state ballast program: Engineering development report, phase 2 [DE84-013882] N84-32726

GAS DYNAMICS
Second- and third-order upwind difference schemes for hyperbolic conservation laws [NASA-TM-85959] N84-33106

GAS FLOW
GCKP84-general chemical kinetics code for gas-phase flow and batch processes including heat transfer effects [NASA-TP-2320] N84-32446
Molten carbonate fuel cell performance model update [DE84-012932] N84-32733
Ekman boundary conditions for numerical models of centrifuge flows [DE84-013576] N84-32765
Simulation of the Kelvin-Helmholtz instability of a supersonic slip surface with the Piecewise-Parabolic Method (PPM) [DE84-013219] N84-32768
Technique for measuring gas conversion factors [NASA-CASE-LAR-13220-1] N84-32786
Laser utilizing a gaseous lasing medium and method for operating the same [DE84-014500] N84-32819
A Gerdien condenser system for measuring stratospheric charged particle densities [AD-A143317] N84-32958

GAS LASERS
Low heat loss laser combustion chamber [AD-D011107] N84-32799
Transverse flow CW atomic iodine laser system [AD-D011098] N84-32810
Laser utilizing a gaseous lasing medium and method for operating the same [DE84-014500] N84-32819

GAS MIXTURES
Gas chromatographic analysis of nitrogen [BLL-RISLEY-TRANS-4563-(9091.9)] N84-32443
Heat-of-mixing experiments for liquefied gases [PB84-215094] N84-32560
Current assessment of the potential of dielectric gas mixtures for industrial applications [DE84-011658] N84-32724

GAS TURBINE ENGINES
Thrust Reverser/Exhaust nozzle assembly for a gas turbine engine [AD-D011101] N84-32392
Turbine blade and vane heat flux sensor development, phase 1 [NASA-CR-168297] N84-32790
Survey of manufacturers of high-performance heat engines adaptable to solar applications [NASA-CR-173911] N84-32919

GAS TURBINES
A study of heat release rate distribution in a gas turbine combustor by acoustic measurements N84-32385
Thrust Reverser/Exhaust nozzle assembly for a gas turbine engine [AD-D011101] N84-32392
Mass transfer from a circular cylinder: Effects of flow unsteadiness and slight nonuniformities [NASA-CR-174759] N84-32751

GAS-SOLID INTERACTIONS
Formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules [AD-A143552] N84-33226

GAS-SOLID INTERFACES
Ekman boundary conditions for numerical models of centrifuge flows [DE84-013576] N84-32765

GASES
Features of behaviour of gas bubbles in molten oxide films during enamelling [BLL-M-35672-(5828.4)] N84-32496

GATES (CIRCUITS)
Universal control grid modulator [AD-D011108] N84-32672
Pulse driver for flux gate magnetometer [AD-D011053] N84-32774
FET charge sensor and voltage probe [NASA-CASE-NPO-16045-1] N84-33211

GEARS
The chemical and physical changes on lubricated surfaces N84-32620

GENERAL AVIATION AIRCRAFT
Development of 2 underseat energy absorbers for application to crashworthy passenger seats for general aviation aircraft [NASA-CR-158927] N84-32367

GENETIC ENGINEERING
Unraveling photosystems [DE84-013612] N84-32994

GEOBOTANY
Remote sensing for geobotanical prospecting N84-32889

GEOCHEMISTRY
The petrology, structure and geochemistry of an Archean terrane in the North Snowy Block, Beartooth Mountains, Montana N84-32940

GEOCHRONOLOGY
Diagensis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938
Lower tertiary biostratigraphy and paleoecology of the Quilcene-Discovery Bay area, northeast Olympic Peninsula, Washington N84-32943
Crystalline rocks of the Northeastern United States [DE84-013673] N84-32962

GEODETIC SURVEYS
Direct measurement of Earth's vertical deflection using global positioning system [AD-D011099] N84-32373
Mojave base station implementation N84-32643

GEOIDS
MAGSAT correlations with geoid anomalies — magnetic anomalies in the western Gulf of Mexico [E84-10190] N84-32894

GEOLOGICAL SURVEYS
Geology and origin of the Aquila iron deposit in southwestern Michoacan, Mexico N84-32890
Assessment of low-temperature geothermal resources of the United States, 1982 [DE84-007193] N84-32902

GEOLOGY
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States [DE84-013672] N84-32901
Geology, petrology and geochronology of the metamorphic rocks of Mesitq Dome, Central Eastern Desert, Egypt N84-32942

GEOMETRICAL OPTICS
Graphical error analysis [BMFT-FB-T-84-061] N84-33093

GEOMETRY
Crack problems for bonded nonhomogeneous materials under antiplane shear loading [NASA-CR-173892] N84-32863
Degrees of adjacency or surroundedness [AD-A143528] N84-33118

GEOMORPHOLOGY
Geology and origin of the Aquila iron deposit in southwestern Michoacan, Mexico N84-32890
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States [DE84-013672] N84-32901
Geomorphic approach to hydrograph synthesis, with potential for application to ungaged watersheds [PB84-190115] N84-32904

GEOPHYSICS
Wave propagation in dense geophysical media [AD-A143213] N84-32955

GEOTHERMAL ENERGY CONVERSION
Compendium of selected methods for sampling and analysis at geothermal facilities [PB84-199926] N84-32579

GEOTHERMAL ENERGY UTILIZATION
Compendium of selected methods for sampling and analysis at geothermal facilities [PB84-199926] N84-32579

GEOTHERMAL RESOURCES
Comparison between two Lysholm engines [DE84-013696] N84-32571
Assessment of low-temperature geothermal resources of the United States, 1982 [DE84-007193] N84-32902

GEOTHERMAL TECHNOLOGY
Altering the volumetric expansion ratio of a Lysholm helical screw expander [DE84-013695] N84-32573
Compendium of selected methods for sampling and analysis at geothermal facilities [PB84-199926] N84-32579

GERDIEN CONDENSERS
A Gerdien condenser system for measuring stratospheric charged particle densities [AD-A143317] N84-32958

GIMBALS
Passive line-of-sight stabilization for an infrared sensor [AD-A143305] N84-32792

GLACIAL DRIFT
Stratigraphy and sedimentology of the upper Proterozoic Kingston Peak Formation, Panamint Range, eastern California N84-32939

GLACIERS
Science support for the Earth radiation budget sensor on the Nimbus-7 spacecraft [NASA-CR-175251] N84-32948

GLASS
Multicomponent diffusion under general chemical potential gradients [DE84-010830] N84-32458
Development and testing of glass coatings for Hexanite-A powders [CSIR-TRANS-1747] N84-32527

GLASS FIBERS
Containerless high purity pulling process and apparatus for glass fibers [NASA-CASE-MFS-25905-2] N84-32569

GLOBAL POSITIONING SYSTEM
Direct measurement of Earth's vertical deflection using global positioning system [AD-D011099] N84-32373

GLOW DISCHARGES
Large aperture electro-optical switch [DE84-013089] N84-32728

GLUCOSE
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds [AD-A142705] N84-33005

GOES SATELLITES
Satellite activities of NOAA, 1983 N84-32408
The severity of the Brazilian freeze of 1981 as monitored in real time by satellite [INPE-2586-PRE/234] N84-32967

GOODNESS OF FIT
Investigation of an empirical probability measure based test for multivariate normality [DE84-012626] N84-33135

GOVERNMENT PROCUREMENT
Analysis of benefits realized from multiyear contracting for the Black Hawk helicopter [AD-A143485] N84-33254

GOVERNMENT/INDUSTRY RELATIONS
Effects of expiration of the Federal energy tax credit on the National Photovoltaics Program [NASA-CR-173900] N84-33299

GRAIN BOUNDARIES
Influence of microalloying with titanium and boron on cold resistance of structural steel [BLL-M-35698-(5828.4)] N84-32483

GRAMMARS
Linguistics N84-33359

GRAPH THEORY
Simulation of large networks of processors by smaller ones [AD-A143529] N84-33098

GRAPHITE
Solid-phase reaction of dispersed graphitized material with aluminium and nickel [BLL-M-35633-(5828.4)] N84-32482
A diffusion mechanism in the catalytic conversion of carbonaceous materials into diamonds at high pressures [CSIR-TRANS-1743] N84-32526
Diamond synthesis from various graphites [CSIR-TRANS-1749] N84-32528

GRAPHITE-EPOXY COMPOSITES
Hole interaction and load introduction effects for compression-loaded laminates with holes [NASA-TM-86267] N84-32435
Failure analysis of a graphite/epoxy laminate subjected to bolt bearing loads [NASA-TM-86297] N84-32436
Hygrothermal effects on mechanical behavior of graphite/epoxy laminates beyond initial failure [NASA-TM-86001] N84-32438

GRAPHOEPITAXY
Submicron structures technology and research N84-33353

GRATINGS
Submicron structures technology and research N84-33353

GRATINGS (SPECTRA)
Definition, analysis and development of an optical data distribution network for integrated avionics and control systems. Part 2: Component development and system integration [NASA-CR-172429] N84-33181
Polynominal grating [AD-D011090] N84-33186

GRAVITATION
Invariant formulation of and radiative corrections in quantum gravity N84-33249

GRAVITATIONAL COLLAPSE
Spherically symmetric radiation in gravitational collapse N84-33312

GRAVITATIONAL EFFECTS
The 64-m antenna automatic subreflector focusing controller N84-32628
Publications of the NASA space biology program for 1980 - 1984 — bibliographies [NASA-TM-86857] N84-32990

GRAVITATIONAL FIELDS
Relative motion characteristics of 2 near-Earth Satellites [NASA-CR-173887] N84-33316

GRAVITATIONAL WAVES
Two-dimensional finite amplitude mountain waves in the presence of moisture N84-32947

GRAVITY ANOMALIES
Direct measurement of Earth's vertical deflection using global positioning system [AD-D011099] N84-32373

GRAVSAT SATELLITE
Relative motion characteristics of 2 near-Earth Satellites [NASA-CR-173887] N84-33316

GREEN'S FUNCTIONS
An integral equation for the solution of nonlinear wave equations N84-32347
A 1-dimensional disk model simulation for klystron design [DE84-013793] N84-32727
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage [DE84-012234] N84-32796
Invariant formulation of and radiative corrections in quantum gravity N84-33249

GRINDING MACHINES
Economic use of CBN grinding tools in the production of jet turbine components [CSIR-TRANS-1736] N84-32561
New machines for grinding, facetting and profiling hard materials [CSIR-TRANS-1750] N84-32621

GROOVES
Modified reflex-percussive grooves for runways [AD-A143569] N84-32400

GROUND EFFECT (COMMUNICATIONS)
Frequency correlation of HF skywave ground backscatter Doppler spectra [PB84-204353] N84-32668
Statistics at HF skywave ground backscatter Doppler spectra [PB84-204973] N84-32669

GROUND STATE
Infrared nonlinear optics N84-33346

GROUND SUPPORT SYSTEMS
A description of the ground segment of CNES, ESA, and TELESAT [INPE-2984-NTE/211] N84-32407

GROUP THEORY
Annals of the Fourier Institute, volume 34, no. 1 [ISSN-0373-0956] N84-33025
The Fourier Plancherel transform for Lie groups. 2: Nilpotent groups N84-33026
Subgroups of continuous groups acting differentiably on the half-line N84-33028
The Levi problem for cohomology classes N84-33032
Determinants connected with a trace on a Banach algebra N84-33036
Fatou theorem for the proper functions of invariant potential operators by a group of Cartan displacements N84-33037
Annals of the Fourier Institute, volume 34, no. 2 [ISSN-0373-0956] N84-33038
Infinitesimal L-classes of a group of algebraic numbers N84-33039
An extension of deLeeuw's theorem to the N-dimensional rotation group N84-33046
Serre's spectral sequence and homotopy N84-33050

GROWTH
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts N84-32998

GULF OF CALIFORNIA (MEXICO)
Paleomagnetism, rock magnetism and diagenesis in hemipelagic sediments from the northeast Pacific Ocean and the Gulf of California N84-32944

GULF OF MEXICO
MAGSAT correlations with geoid anomalies — magnetic anomalies in the western Gulf of Mexico [E84-10190] N84-32694

GUNN DIODES
Millimetric wave frequency converter using Gunn-effect diode N84-32607

GUNN EFFECT
Millimetric wave frequency converter using Gunn-effect diode N84-32607
Stable asynchronous two-frequency oscillations in Gunn-effect diode with open resonator structure N84-32611

GYROSCOPES
Temperature controlled gyro [AD-D011138] N84-32777
Passive line-of-sight stabilization for an infrared sensor [AD-A143305] N84-32792

H

H ALPHA LINE
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981 [PB84-201508] N84-33329
Solar-Geophysical Data, no. 475, March 1984. Part 2: Comprehensive reports. Data for September 1983, May 1981 and miscellanea [PB84-201516] N84-33330

HABITABILITY
The feasibility, practicality and utility of P-3 inflight refueling [AD-A143419] N84-32382

HADRONS
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-hadron systems, hadron form factors, and Dirac particles [DE84-012971] N84-33161
High energy physics research at Texas Agriculture and Mining University — magnetic monopoles in cosmic rays and hadron calorimeter design [DE84-011616] N84-33167

HAFNIUM COMPOUNDS
RF sputtered silicon and hafnium nitrides as applied to 440C steel [NASA-TM-86862] N84-32536

HALL EFFECT
Quantum transport in low dimensional disordered systems N84-33347

HARDNESS
Metal coating of diamond abrasives (review of foreign patents) [CSIR-TRANS-1740] N84-32489
Slavutich high-cobalt WC-Co-matrix alloy [CSIR-TRANS-1739] N84-32490
Pastes of superhard materials (review of inventions) [CSIR-TRANS-1741] N84-32491

HARMONIC ANALYSIS
Image identification by method of integral fluctuations N84-32601
An extension of deLeeuw's theorem to the N-dimensional rotation group N84-33046

HARMONIC FUNCTIONS
Annals of the Fourier Institute, volume 34, no. 1 [ISSN-0373-0956] N84-33025
On the boundary limits of harmonic functions with gradient in L sup p N84-33030
The growth of plurisubharmonic functions in infinite domain N84-33033
Annals of the Fourier Institute, volume 34, no. 2 [ISSN-0373-0956] N84-33036
On the A-integrability of singular integral transforms N84-33042

HARMONICS
A 1-dimensional disk model simulation for klystron design [DE84-013793] N84-32727
Harmonic maps from S-2 to IHP-2 N84-33109
Period-doubling 2-torus state in a convecting He-3-superfluid He-4 solution [DE84-006985] N84-33243

HARNESSES
Position and restraint system for aircrewman [AD-D011058] N84-32364

HAZARDS
Seismic hazard study for selected sites in New Mexico and Nevada [AD-A143382] N84-32960
Evaluation and control of laser hazards N84-33018

HEALTH
Review of occupational medicine relevant to aviation medicine N84-33012

HEALTH PHYSICS
Develop real-time dosimetry concepts and instrumentation for long-term missions [NASA-CR-171809] N84-32791

HEAT EXCHANGERS
Heat transfer with phase change in plate-fin heat exchangers [DE84-006405] N84-32771

HEAT FLUX
Development of advanced thermal insulation for appliances [DE84-013132] N84-32763
Turbine blade and vane heat flux sensor development, phase 1 [NASA-CR-168297] N84-32790
Urban scale variations of turbulence parameters and fluxes [PB84-209113] N84-32960

HEAT MEASUREMENT
Heat-of-mixing experiments for liquefied gases [PB84-215094] N84-32560

HEAT PIPES
Multi-leg heat pipe evaporator [NASA-CASE-MSC-20812-1] N84-32748

HEAT PUMPS
High efficiency heat pump using ground heat source [DE84-006385] N84-32761

HEAT RESISTANT ALLOYS
A procedure for determining the tempo at which alloys solidify [BLL-M-35642-(5828.4)] N84-32497
Response of Inconel 617 superalloy to combined ground-based and STS reentry exposure [NASA-TM-86293] N84-32505
Swedish research in high-temperature ceramics, superalloys N84-33142

HEAT SHIELDING
Effect of alloy chemistry and exposure conditions on the oxidation of titanium [NASA-TM-86295] N84-32507

HEAT SOURCES
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage [DE84-012234] N84-32796

HEAT STORAGE
Stable density stratification solar pond [NASA-CASE-NPO-15419-2] N84-32910

HEAT TRANSFER
A study of heat release rate distribution in a gas turbine combustor by acoustic measurements N84-32385
A study of leeside flow field heat transfer on Shuttle Orbiter configuration [NASA-CR-172362] N84-32410
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door [NASA-CR-171732] N84-32416
GCKP84-general chemical kinetics code for gas-phase flow and batch processes including heat transfer effects [NASA-TP-2320] N84-32446
High temperature metallic recuperator [PB84-207869] N84-32575
The development of a high-capacity instrument module heat transport system, appendixes [NASA-CR-175260] N84-32750
Mass transfer from a circular cylinder: Effects of flow unsteadiness and slight nonuniformities [NASA-CR-174799] N84-32751
Heat transfer with phase change in plate-fin heat exchangers [DE84-006405] N84-32771
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage [PB84-197995] N84-32773
Low heat loss laser combustion chamber [AD-D011107] N84-32799
Heat transfer, fluid flow and element vaporization in laser welding [DE84-011783] N84-32839
Wind loading on solar concentrators: Some general considerations [NASA-CR-173696] N84-32915
Dynamics of heat, mass and momentum transfer in an inductively coupled plasma [DE84-013499] N84-33200

HEAT TREATMENT
Composition and structure of multicomponent vanadium- and niobium-base coatings [BLL-M-35657-(5828.4)] N84-32474
Cubic silicon nitride in iron-silicon steels [BLL-M-35653-(5828.4)] N84-32488
Effect of precipitated austenite on the fracture of a ferritic cryogenic steel [DE84-014604] N84-32521

HEATING
High temperature metallic recuperator [PB84-207869] N84-32575

HEATING EQUIPMENT
Advancement of developmental technology for pulse combustion applications [PB84-215286] N84-32576

HEAVY IONS
A determination of the charge state of energetic magnetospheric ions by the observation of drift echoes [AD-A143181] N84-32954
Present status and probable future capabilities of heavy-ion linear accelerators [DE84-011741] N84-33156
Spot heating calculation for a heavy ion driven high temperature experiment [DE84-013879] N84-33159

HELICAL ANTENNAS
Backfire bifilar helix antenna [AD-D011118] N84-32719

HELICAL FLOW
Comparison between two Lysholm engines [DE84-013696] N84-32571

HELICOPTERS
An integral equation for the solution of nonlinear wave equations N84-32347
Noise measurement flight test: Data-analyses Aerospatiale SA-365N Dauphin 2 helicopter [AD-A143229] N84-33151
Analysis of benefits realized from multiyear contracting for the Black Hawk helicopter [AD-A143485] N84-33254

HELIOSTATS
Evolution of integrated panel structural design and interfaces for PV power plants N84-32701

HELIUM ISOTOPES
Maximum supercooling in liquid 3He-4He mixtures near the tricritical point [DE84-010076] N84-33232
Dynamical scaling in 3He-4He liquid mixtures [DE84-010072] N84-33233

HELMHOLTZ EQUATIONS
On accuracy conditions for the numerical computation of waves [NASA-CR-172433] N84-33111

HELMHOLTZ VORTICITY EQUATION
Numerical diffraction by a uniform grid [DE84-012661] N84-33121

HEMATOPOIETIC SYSTEM
Correlation between plasma fibronectin level and mortality following experimental rate heat stress [AD-A143363] N84-32991

HEMOGLOBIN
Oxygen affinity of hemoglobin, 3 hours after passive increase in altitude from 400 to 1800 metres [RAE-TRANS-2118] N84-33004

HETERODYNING
Development of long wavelength semiconductor diode lasers near 28 microns for use in infrared heterodyne spectrometers [NASA-CR-175253] N84-32602

HETEROGENEITY
Distribution of micro-heterogeneous deformation in O6Yu steel around inclusions during compression [BLL-M-35641-(5828.4)] N84-32498
The proximity effects of superconducting multilayer film [AD-A143256] N84-33217

HETEROJUNCTION DEVICES
Influence of the interfacial layer on electrooptical properties of heterojunction solar cells [DE84-013295] N84-32925

HETEROJUNCTIONS
Schottky barrier and homojunction gallium arsenide solar cells N84-32907
CdS/CuInSe2 heterojunction cell research [DE84-004506] N84-32926

HF LASERS
Pulsed hydrogen-fluoride laser [MRL-R-931] N84-32903
CW HF R-branch laser [AD-D011120] N84-32913

HIERARCHIES
Source hierarchy list. Volume 1: A through H [AD-A143500] N84-33291
Source hierarchy list. Volume 2: I through Z [AD-A143501] N84-33292

HIGH ALTITUDE
Investigation of the external flow analysis for density measurements at high altitude — shuttle upper atmosphere mass spectrometer experiment [NASA-CR-173681] N84-32352

HIGH ENERGY ELECTRONS
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32948

HIGH ENERGY INTERACTIONS
Influence of choice of pair-interaction potential on results of modelling an edge dislocation in Alpha-Iron [BLL-M-35663-(5828.4)] N84-32499
Future of high energy physics [DE84-013513] N84-33165

HIGH FREQUENCIES
High frequency radar software reference manual for product one [PB84-194885] N84-32565
Frequency correlation of HF skywave ground backscatter Doppler spectra [PB84-204353] N84-32568
Statistics of HF skywave ground backscatter Doppler spectra [PB84-204973] N84-32569
Detection of damage in hydraulic components by acoustic emission techniques [AD-A143262] N84-32850
High-frequency acoustic backscatter from the sea surface [AD-A143536] N84-33152

HIGH GRAVITY ENVIRONMENTS
Mechanisms of thermoregulation of rats exposed to hypergravic fields N84-32969

HIGH LEVEL LANGUAGES
The Record of Electrical and Communication Engineering Conversazione, volume 53, no. 1, Jul. 1984 [ISSN-0385-7719] N84-32565
On applications of a specification and description language NESDEL to communication protocols N84-32567
High-level operations in nonprocedural programming languages [AD-A143470] N84-33078

HIGH POWER LASERS
Eye safe laser transmitter [AD-D011145] N84-32779
Replication of high power laser mirrors [AD-D011140] N84-33177

HIGH PRESSURE
Anomalous pressure dependence of dipolar relaxation times in rare earth doped lead fluoride [AD-A143201] N84-33215

HIGH RESOLUTION
Highly sensitive high resolution Raman spectroscopy using resonant ionization methods [DE84-012240] N84-32460
Polynominal grating [AD-D011090] N84-33186
Photon correlation spectroscopy and applications N84-33352

HIGH SPEED
High-speed thyristors on weakly doped GaAs N84-32600
High-efficiency particulate air filter behavior at high-speed flows [DE84-014137] N84-32769

HIGH STRENGTH STEELS
Microstructure, mechanical properties and two-body abrasive wear resistance of an Fe-3Cr-C based ultra-high strength steel [DE84-014605] N84-32520

HIGH TEMPERATURE
Reference plant for high temperature electrodialysis desalting of seawater
[PB84-195841] N84-32471
Response of Inconel 617 superalloy to combined ground-based and STS reentry exposure
[NASA-TM-86293] N84-32505
Ferrous alloy metallurgy, liquid lithium corrosion and welding
[DE84-014856] N84-32517
Low-chromium heat-resisting ferritic alloys strengthened by the Chi Phase
[PB84-199041] N84-32524
High temperature electronics technology
[AD-A143571] N84-32714
Thermal shock: High temperature high energy rate testing
[DE84-014147] N84-32866
Negative electrode catalyst for the iron-chromium REDOX energy storage system
[NASA-CASE-LEW-14028-1] N84-32909
Spot heating calculation for a heavy ion driven high temperature experiment
[DE84-013679] N84-33159
New materials from high temperature synthesis
[DE84-014125] N84-33231

HIGH TEMPERATURE ENVIRONMENTS
Electronically conductive ceramics for high temperature oxidizing environments
[DE84-014506] N84-32549

HIGH TEMPERATURE TESTS
High temperature metallic recuperator
[PB84-207869] N84-32575
Hot-spot heating in central-station arrays N84-32686

HIGH VOLTAGES
Hipot and continuity qualification est experience N84-32692
Electrical safety for high voltage arrays N84-32697
Modeling of lethal electric shock N84-33000

HIGHLY MANEUVERABLE AIRCRAFT
Air data position-error calibration using state reconstruction techniques
[NASA-TM-86029] N84-32384

HISTORIES
Forty years of development in diamond tools
[CSIR-TRANS-1730] N84-32564

HOLE DISTRIBUTION (MECHANICS)
Hole interaction and load introduction effects for compression-loaded laminates with holes
[NASA-TM-86287] N84-32435

HOLES (ELECTRON DEFICIENCIES)
Relativistic calculations and measurements of energies, Auger rates, and lifetimes
[AD-A143423] N84-33220
Formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules
[AD-A143552] N84-33226

HOLOGRAPHY
Phase-only optical filter for use in an optical correlation system
[AD-D011093] N84-33187

HOMOGENEITY
Crack problems for bonded nonhomogeneous materials under antiplane shear loading
[NASA-CR-173892] N84-32863

HOMOLOGY
Annals of the Fourier Institute, volume 34, no. 1
[ISSN-0373-0956] N84-33025
Non-degenerescence of some spectral sequences N84-33027
The Levi problem for cohomology classes N84-33032
Annals of the Fourier Institute, volume 34, no. 2
[ISSN-0373-0956] N84-33038
Serre's spectral sequence and homotopy N84-33050

HOOKS
Adjustable self-releasing hook
[AD-D011062] N84-32834

HORN ANTENNAS
Concerning power recovered by receiving antenna from incident field N84-32584

HOT-FILM ANEMOMETERS
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197095] N84-32773

HUBBLE SPACE TELESCOPE
Spinoff, 1984
[NASA-TM-85596] N84-33305

HUMAN BEHAVIOR
Interactive information environments: A plan for enabling interdisciplinary research
[RAND/N-2115] N84-33284

HUMAN BEINGS
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009

HUMAN BODY
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies
[AD-A143507] N84-32992

HUMAN FACTORS ENGINEERING
Photodigitizing procedures
[AD-A143589] N84-32793
Pilot jet lag experiments described N84-32997
Review of occupational medicine relevant to aviation medicine N84-33012
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11534-1] N84-33021
Teleoperator human factors study
[NASA-CR-173890] N84-33022
Battery Computer System (BCS) human factors field evaluation
[AD-A143425] N84-33062

HUMAN PERFORMANCE
Optional stopping performance under graphic and numeric CRT formatting
[AD-A143274] N84-32712
Comparison of CRT (Cathode Ray Tube) antireflection filters
[PB84-202753] N84-32742
Portable visual function tester
[AD-D011105] N84-32795
Determination of factors affecting performance and productivity in an engineering/design environment
[AD-A143315] N84-33252

HUMAN TOLERANCES
Modeling of lethal electric shock N84-33000

HURRICANES
Hurricane Alicia: Prediction, damage and recovery efforts
[GPO-33-446] N84-32968

HYDRAULIC EQUIPMENT
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32650

HYDRAULIC FLUIDS
Method for the particle size independent spectrometric determination of metal particles in lubricating oils and hydraulic fluids
[AD-D011121] N84-32445

HYDRAULIC JETS
Warm fog dissipation using large volume water sprays
[NASA-CASE-MFS-25962-1] N84-32396

HYDRAZINES
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Hydrazine toxicology: Impact on safety and health in military aviation N84-33013
Handling of hydrazine in the Royal Danish Air Force N84-33014

HYDROCARBON FUELS
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
Liquified natural gas densities: Summary of research program at the National Bureau of Standards
[PB84-202647] N84-33297

HYDROCARBONS
Cleavage of aromatic carbon-carbon bonds
[DE84-010161] N84-32432
Technique for measuring gas conversion factors
[NASA-CASE-LAR-13220-1] N84-32786

HYDROCHLORIC ACID
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km
[NASA-CR-173879] N84-32951

HYDRODYNAMIC EQUATIONS
Certain assumptions of theory of hydrodynamic lubrication during metal pressure working
[BLL-M-35681-(5828.4)] N84-32822

HYDRODYNAMICS
Sloshing response of a reactor tank with internals
[DE84-009829] N84-32766

HYDROFLUORIC ACID
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km
[NASA-CR-173879] N84-32951

HYDROGEN
Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556
Ultraviolet interstellar absorption toward stars in the small Magellanic cloud N84-33313

HYDROGEN ATOMS
Theoretical research program to predict the properties of molecules and clusters containing transition metal atoms
[NASA-CR-173924] N84-32502

HYDROGEN EMBRITTLEMENT
Theoretical research program to predict the properties of molecules and clusters containing transition metal atoms
[NASA-CR-173924] N84-32502

HYDROGEN FUELS
Refueling considerations for liquid-hydrogen fueled vehicles
[DE84-012623] N84-32557

HYDROGEN IONS
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192
Method for fabricating MNOS structures utilizing hydrogen ion implantation
[AD-D011123] N84-33208

HYDROGEN OXYGEN ENGINES
Retardation analytical model to extend service life
[NASA-CR-173891] N84-32862

HYDROGEN PEROXIDE
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km
[NASA-CR-173879] N84-32951

HYDROGEN PLASMA
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192

HYDROGEN PRODUCTION
Summary status of advanced water electrolysis and hydrogen storage/transport research and development
[DE84-012908] N84-32456

HYDROGRAPHY
Geomorphic approach to hydrograph synthesis, with potential for application to ungaged watersheds
[PB84-190115] N84-32904
Hydrographic measurements in the western Arlboran Sea, October 1982
[AD-A143588] N84-32985

HYDROLOGY
Agriculture and water use: Present and future issues
[GPO-30-599] N84-32897
DCP systems and characteristics
[INPE-2948-PRE/431] N84-32899
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States
[DE84-013672] N84-32901

HYDROLOGY MODELS
A geographic information system for regional hydrologic modeling N84-32891

HYDROPLANING
Modified reflex-percussive grooves for runways
[AD-A143569] N84-32400

HYDROSTATIC PRESSURE
Underwater depth telemetry
[AD-D011054] N84-32418
Association and bound motion in alkali metal doped cadmium fluoride
[AD-A143200] N84-32450
Pressure-dependent resistive behavior of YbBe13
[DE84-010068] N84-32514

HYDROSTATICS
NASTRAN structural model for the large 64-meter antenna pedestal. Part 3: Applications to hydrostatic bearing oil film N84-32838

HYDROXYL COMPOUNDS
A study of Beta-hydroxyamines and Beta-hydroxysulphides as corrosion inhibitors for metals
[BLL-T6313/BG/WH773/84] N84-32487

HYDROXYL RADICALS
Protected ethynylated phenols
[AD-D011096] N84-32544
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km
[NASA-CR-173879] N84-32951

HYGIENE
Review of occupational medicine relevant to aviation medicine N84-33012

HYPERBOLIC SYSTEMS
The time evolution of spectral discretizations of hyperbolic systems
[NASA-CR-172432] N84-33113
Stability analysis of finite difference schemes for hyperbolic systems, and problems in applied and computational linear algebra
[AD-A143537] N84-33119

HYPERFINE STRUCTURE
Radio astronomy N84-33349

HYPERNUCLEI
Gamma-ray spectroscopy of hypernuclei
[DE84-013142] N84-33162

HYPERSONIC REENTRY
Response of Inconel 617 superalloy to combined ground-based and STS reentry exposure
[NASA-TM-86293] N84-3250

HYPERVENTILATION
Oxygen affinity of hemoglobin, 3 hours after passive increase in altitude from 400 to 1800 metres
[RAE-TRANS-2118] N84-33004
HYSTERESIS
Fiber optic magnetometer for the detection of dc magnetic fields without hysteretic ambiguity
[AD-D011085] N84-32794

I

IBM COMPUTERS
IBM's token-ring LAN (Local-Area Network): A base-level communications solution
[AD-A143446] N84-33063
Asynchronous file transfer to IBM PC's N84-33275
ICE MAPPING
Bering Air-Sea-Ice Study (BASICS), February and March, 1981
[PB84-196161] N84-32903
IDEAL GAS
GCKP84-general chemical kinetics code for gas-phase flow and batch processes including heat transfer effects
[NASA-TP-2320] N84-32446
IDENTIFYING
Rapid microbial identification by circular intensity differential scattering
[DE84-013894] N84-32993
IGNEOUS ROCKS
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States
[DE84-013672] N84-32901
Crystalline rocks of the Northeastern United States
[DE84-013673] N84-32962
IMAGE ANALYSIS
LANDSAT-4 image data quality analysis — LANDSAT 5 imagery
[E84-10173] N84-32893
IMAGE ENHANCEMENT
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172
IMAGE PROCESSING
Image identification by method of integral fluctuations N84-32601
Programmable signal processing device
[AD-D011109] N84-32673
Photodigitizing procedures
[AD-A143589] N84-32793
Aspects of the Brazil current system according to SMS-2, NOAA-6, and Tiros-N satellites for 1979 to 1980
[INPE-2975-RPE/450] N84-32962
Array processor utilization in the computation of real-time images
[ARL-SYS-TM-73] N84-33058
The compression of digital imagery by transformation
[INPE-2893-PRE/412] N84-33073
Varying bandpass of optical spatial filter by rotating mirrors having changing reflectivity
[AD-D011114] N84-33173
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183
Digital signal processing N84-33357
Cognitive information processing N84-33360
IMAGE RESOLUTION
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892
IMAGERY
Degrees of adjacency or surroundedness
[AD-A143528] N84-33118
IMAGES
Image identification by method of integral fluctuations N84-32601
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183
IMAGING TECHNIQUES
Image identification by method of integral fluctuations N84-32601
Computer vision for real-time orbital operations. Center directors discretionary fund
[NASA-TM-86457] N84-33076
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183
Conceptual design of a monitoring system for the Charters of Freedom
[NASA-CR-173909] N84-33285
Cognitive information processing N84-33360
IMMUNOLOGY
Immunologic effects of electromagnetic fields (1981 - 1983)
[PB84-190602] N84-33008
IMPACT FUSION
Research and development of a plasma jet mass accelerator as a driver for impact fusion
[DE84-012940] N84-33198
IMPACT LOADS
The importance of impact pressure in the development of the process of formation of bonds between metals in the solid phase
[BLL-M-35655-(5828.4)] N84-32473
IMPACT TESTS
Textile ballistic performance (data base)
[AD-A143249] N84-32541
IMPEDANCE
Beam cavity coupling impedance
[DE84-014064] N84-32662
Experimental investigation of certain beam transport issues in a pulsed transmission line linear accelerator
[DE84-011191] N84-33164
Anomalous surface impedance in reentrant ferromagnetic superconductors
[DE84-012634] N84-33230
IMPEDANCE MATCHING
A high-performance hybrid RF isolation amplifier N84-32623
IMPELLERS
An improved method for the prediction of centrifugal compressor rotational-tone noise
[DE84-013345] N84-32642
IMPURITIES
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors
[AD-A143551] N84-33225
INCENTIVES
Effects of expiration of the Federal energy tax credit on the National Photovoltaics Program
[NASA-CR-173900] N84-33299
INCLUSIONS
Solid-phase reaction of dispersed graphitized material with aluminium and nickel
[BLL-M-35633-(5828.4)] N84-32482
Distribution of micro-heterogeneous deformation in O8Yu steel around inclusions during compression
[BLL-M-35641-(5828.4)] N84-32498
The nature and origin of refractory inclusions in the Allende meteorite N84-33318
INCOMPRESSIBLE FLOW
Fast solutions to the steady state compressible and incompressible fluid dynamic equations
[NASA-CR-172416] N84-32349
A finite element implementation of the dual variable method for the Navier-Stokes equations N84-32746
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
A two-fluid instability
[DE84-012899] N84-32764
INCONEL (TRADEMARK)
Response of Inconel 617 superalloy to combined ground-based and STS reentry exposure
[NASA-TM-86293] N84-32505
Effect of surface doping on the oxidation of chromia former alloys
[DE84-013390] N84-33247
INDEXES (DOCUMENTATION)
Aeronautical Engineering: A Continuing Bibliography with indexes
[NASA-SP-7037(178)] N84-32343
Physics in Europe: A data file of selected research
[AD-A143428] N84-33289
Source hierarchy list. Volume 1: A through H
[AD-A143500] N84-33291
Source hierarchy list. Volume 2: I through Z
[AD-A143501] N84-33292
INDIUM ALLOYS
Preparation of high purity Ga(X)In(1-x) by the VPE-hydride method with a gallium-indium alloy source
[AD-A143275] N84-33218
INDIUM ARSENIDES
Preparation of high purity Ga(X)In(1-x) by the VPE-hydride method with a gallium-indium alloy source
[AD-A143275] N84-33218
INDIUM PHOSPHIDES
Basic problems in InP technology
[AD-A143456] N84-33222
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors
[AD-A143551] N84-33225
INDUSTRIAL PLANTS
Reference plant for high temperature electrodialysis desalting of seawater
[PB84-195841] N84-32471
INDUSTRIAL SAFETY
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Review of occupational medicine relevant to aviation medicine N84-33012
Hydrazine toxicology: Impact on safety and health in military aviation N84-33013
INDUSTRIES
Forty years of development in diamond tools
[CSIR-TRANS-1730] N84-32564
INELASTIC COLLISIONS
Atomic resonance and scattering N84-33339
INEQUALITIES
Variability orderings related to coverage problems on the circle
[AD-A143364] N84-33130
INERTIA PRINCIPLE
Assessment of trends of input actions of inertial objects
[BLL-M-35689-(5828.4)] N84-33104
INERTIAL CONFINEMENT FUSION
Dynamic testing of NOVA laser structural systems. The north side of Spaceframe Tower
[DE84-014830] N84-32616
INERTIAL FUSION (REACTOR)
Research and development of a plasma jet mass accelerator as a driver for impact fusion
[DE84-012940] N84-33198
INERTIAL NAVIGATION
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372
INERTIAL UPPER STAGE
Materials testing of the IUS techroll seal material
[NASA-TM-86462] N84-32829
INFECTIOUS DISEASES
Rapid microbial identification by circular intensity differential scattering
[DE84-013894] N84-32993
INFERENCE
Bounded-influence inference in regression
[AD-A143195] N84-33126
INFORMATION DISSEMINATION
Random multiple access methods in multi-user communication systems N84-32616
Locating and estimating air emissions from sources of acrylonitrile
[PB84-200609] N84-32934
Locating and estimating air emissions from sources of carbon tetrachloride
[PB84-200625] N84-32936
ADA (trademark) training curriculum. Basic ADA programming I202 teacher's guide, volume 2
[AD-A143585] N84-33084
An online directory of databases for material properties
[DE84-013210] N84-33099
Goals and activities of the National Commission on Libraries and Information Science
[ISSN-0091-2972] N84-33282
A decade of accomplishment
[ISSN-0091-2972] N84-33283
European scientific notes, Volume 38, Number 7
[AD-A143236] N84-33267
INFORMATION FLOW
Interactive information environments: A plan for enabling interdisciplinary research
[RAND/N-2115] N84-33284
INFORMATION MANAGEMENT
The administrative window into the integrated DBMS N84-33270
Interactive information environments: A plan for enabling interdisciplinary research
[RAND/N-2115] N84-33284
INFORMATION RETRIEVAL
An evaluation of two reliability and maintainability information systems
[AD-A143438] N84-33290
Adaptive subject description in document retrieval N84-33296
INFORMATION SYSTEMS
A geographic information system for regional hydrologic modeling N84-32891
Design, test, and evaluation of an Air Force environmental model and data exchange
[AD-A143226] N84-33060
IBM's token-ring LAN (Local-Area Network): A base-level communications solution
[AD-A143446] N84-33063
An online directory of databases for material properties
[DE84-013210] N84-33099
The role of the state library agency in the future: A Delphi study N84-33256

Implementing automated information systems in the Air Force
[AD-A143396] N84-33286
Solar-terrestrial data access distribution and archiving
[NASA-CR-173906] N84-33295
INFORMATION THEORY
Visual perception in systems management in aeronautics N84-33017
A study of the extent of automation in small college libraries and relationships of attitudes of library directors toward it N84-33260
INFORMATION TRANSFER
An exploratory analysis of the relationship between media richness and managerial information processing
[AD-A143503] N84-33293
INFRARED ABSORPTION
Infrared absorption spectrum of free carriers in polar semiconductors
[DE84-013276] N84-33248
INFRARED DETECTORS
Passive line-of-sight stabilization for an infrared sensor
[AD-A143305] N84-32792
INFRARED IMAGERY
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651
Quantitative analysis of satellite infrared imagery using digital storage equipment
[INPE-2978-PRE/440] N84-33074
INFRARED LASERS
Visible and near-infrared dissociation lasers
[AD-A143295] N84-32807
INFRARED RADAR
Optical propagation and communication N84-33355
INFRARED RADIATION
Expendable infrared source and method therefor
[AD-D011112] N84-32551
Infrared nonlinear optics N84-33346
INFRARED RADIOMETERS
Intelligent infrared sensor
[BMFT-FB-T-84-092] N84-33189
INFRARED SPECTRA
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km
[NASA-CR-173879] N84-32951
INFRARED SPECTROSCOPY
Raman and infrared spectroscopy of molecules adsorbed on metal electrodes
[AD-A143466] N84-32454
Cure reactions, network structure and mechanical response of diaminodiphenyl sulfone cured tetraglycidyl 4,4'diaminodiphenyl methane
[DE84-012607] N84-32548
INGOTS
Influence of direct current on temperature gradient in directionally solidifying ingot of alloy YuNDK35T5
[BLL-M-35684-(5828.4)] N84-32495
INGRESS (SPACECRAFT PASSAGEWAY)
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door
[NASA-CR-171732] N84-32416
INHIBITORS
Influence of diluents and inhibitors on detonations
[DE84-006300] N84-32463
INHOMOGENEITY
Reflection of electromagnetic waves from inhomogeneous media N84-32586
Diffusion modeling with convective scaling and effects of surface inhomogeneities
[PB84-210053] N84-32981
INJECTION
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619
INPUT/OUTPUT ROUTINES
Aerodynamic heating computations for projectiles. Volume 3: BRL interactive plotting program (BRLINPLOT)
[AD-A143254] N84-32361
Programmable signal processing device
[AD-D011109] N84-32673
COSMIC/NASTRAN free-field input N84-32865
I/O channel interface
[NBS-FIPS-PUB-60-2] N84-33057
ADA (trademark) training curriculum. Basic ADA programming (202 teacher's guide, volume 2
[AD-A143585] N84-33084
INSPECTION
Robotiesation of dye penetrant inspection: A study of a prototype and its development
[BLL-RISLEY-TRANS-4585-(9091.9)] N84-32847
Eddy current testing of steam generator tubes
[BLL-RISLEY-TRANS-4584-(9091.9)] N84-32848
INSTRUMENT PACKAGES
The development of a high-capacity instrument module heat transport system, appendixes
[NASA-CR-175260] N84-32750
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171128] N84-32949
INSULATION
Preliminary guidelines for maintenance of polyurethane foam (PUF) roofing systems
[AD-A143455] N84-32543
INTEGRAL EQUATIONS
Broadside radar cross section of the perfectly conducting cube
[AD-A143321] N84-32656
Implicit function method for the Liouville equation
[DE84-013282] N84-33140
INTEGRAL TRANSFORMATIONS
On the A-integrability of singular integral transforms N84-33042
INTEGRATED CIRCUITS
A simple algorithm for the metric traveling salesman problem N84-32631
Phase shift keying apparatus
[AD-D011119] N84-32660
Method for making Josephson junctions with contamination-free interfaces utilizing a ZNO contact insulator
[AD-D011057] N84-32671
Monolithic integrated antenna systems
[AD-A143184] N84-32708
Research in monolithic, signal-processing circuits
[AD-A143204] N84-32709
Wafer-scale laser pantography. Part 6: Direct-write interconnection of VLSI gate arrays
[DE84-012676] N84-32815
Test procedures and design methods for reliable large scale integrated circuits and systems
[AD-A143324] N84-33061
RLE Progress Report no. 126
[RLE-PR-126] N84-33336
INTEGRITY
Deduction in nonhorn databases N84-33263
INTELLIGENCE
The feasibility, practicality and utility of P-3 inflight refueling
[AD-A143419] N84-32382
INTENSITY
Eye safe laser transmitter
[AD-D011145] N84-32779
INTERCALATION
X-ray diffuse scattering N84-33341
INTERFACES
Radio frequency distribution assembly
[AD-A143575] N84-32658
Interface standardization N84-32700
Is structural interface standardization beneficial? N84-32702
I/O channel interface
[NBS-FIPS-PUB-60-2] N84-33057
Coupling of Rayleigh-like waves with zero sound modes in normal He-3
[DE84-010519] N84-33153
Local electronic properties of semiconductor surfaces and interfaces
[DE84-013606] N84-33239
INTERFACIAL ENERGY
Optical power source control system
[AD-D011124] N84-33175
INTERFACIAL TENSION
Thermally induced instabilities of two-layer fluid systems N84-32745
INTERFERENCE DRAG
Computer studies of hybrid-slotted working sections with minimum interference at subsonic speeds
[NASA-TM-86002] N84-32379
INTERFEROMETERS
Signal waveform detector using synthetic FM demodulation
[AD-D011055] N84-32618
Fiber optic magnetometer for the detection of dc magnetic fields without hysteretic ambiguity
[AD-D011085] N84-32794
INTERFEROMETRY
Interferometrically tuned laser resonator
[AD-D011125] N84-32800
INTERMEDIATE FREQUENCIES
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619
Coherent digital demodulation of a residual carrier signal using IF sampling N84-32634
INTERMETALLICS
Low-chromium heat-resisting ferritic alloys strengthened by the Chi Phase
[PB84-190041] N84-32524
INTERMODULATION
Intermodulation distortions in semiconductor microwave receivers and transmitters (survey) N84-32605
Intermodulation in protective semiconductor microwave devices N84-32612
Intermodulation product levels in flame-sprayed materials N84-32629
The 20 x 20 high speed microwave switches
[NASA-TM-83775] N84-32644
INTERNAL COMBUSTION ENGINES
Experimental and modeling study of engine knock
[DE84-006134] N84-32844
INTERNAL PRESSURE
Investigation into the internal aerodynamic design and associated errors in a fast descent ducted sonde for the measurement of atmospheric pressure and temperature (AMPARS phase 2)
[AD-A143189] N84-32969
INTERNATIONAL COOPERATION
Workshop on Systems Analysis
[PB84-194661] N84-33138
INTERPLANETARY DUST
The nature and origin of refractory inclusions in the Allende meteorite N84-33318
INTERPLANETARY MAGNETIC FIELDS
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201508] N84-33329
INTERPROCESSOR COMMUNICATION
IBM's token-ring LAN (Local-Area Network): A base-level communications solution
[AD-A143446] N84-33063
Summary of research performed at MIT Laboratory for Computer Science
[AD-A143459] N84-33064
Higher layer protocols for a workstation architecture
[DE84-013649] N84-33067
INTERSTELLAR MATTER
Radio astronomy N84-33349
INTERVALS
One-sided r-reliable intervals and their associated confidences on the sum of two Continuous/Independent, random variables
[AD-A143387] N84-33131
INVENTIONS
Coatings on diamond and CBN abrasives (review of inventions)
[CSIR-TRANS-1742] N84-32525
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents. Appendix
[PB84-196997] N84-33255
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents
[PB84-197003] N84-33256
INVERTED CONVERTERS (DC TO AC)
A study of the high frequency limitations of series resonant converters
[NASA-CR-173868] N84-32678
High-intensity discharge (HID) solid-state ballast program: Engineering development report, phase 2
[DE84-013882] N84-32726
INVISCID FLOW
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85980] N84-32358
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
Second- and third-order upwind difference schemes for hyperbolic conservation laws
[NASA-TM-85959] N84-33106
IODINE LASERS
Transverse flow CW atomic iodine laser system
[AD-D011098] N84-32610
ION ACCELERATORS
Present status and probable future capabilities of heavy-ion linear accelerators
[DE84-011741] N84-33158
ION BEAMS
Improved heat exchanger for electrothermal devices
[NASA-CASE-LEW-14037-1] N84-32425
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957
ION CURRENTS
Association and bound motion in alkali metal doped cadmium fluoride
[AD-A143200] N84-32450
Multicomponent diffusion under general chemical potential gradients
[DE84-010830] N84-32458
Anomalous pressure dependence of dipolar relaxation times in rare earth doped lead fluoride
[AD-A143201] N84-33215
ION DENSITY (CONCENTRATION)
A Gerdien condenser system for measuring stratospheric charged particle densities
[AD-A143317] N84-32958

ION ENGINES
Thermionic conversion reactor technology assessment
[DE84-007611] N84-33168
ION EXCHANGE MEMBRANE ELECTROLYTES
Reference plant for high temperature electrodialysis desalting of seawater
[PB84-195841] N84-32471
ION IMPLANTATION
Method for fabricating MNOS structures utilizing hydrogen ion implantation
[AD-D011123] N84-33208
Basic problems in InP technology
[AD-A143456] N84-33222
ION IRRADIATION
Ion bombardment damage in a modified Fe-9Cr-1Mo steel
[DE84-014266] N84-32522
ION MOTION
Nuclear magnetic resonance studies of ion motion in solid electrolytes
[DE84-013646] N84-33238
ION TEMPERATURE
Spot heating calculation for a heavy ion driven high temperature experiment
[DE84-013879] N84-33159
IONIZATION
Highly sensitive high resolution Raman spectroscopy using resonant ionization methods
[DE84-012240] N84-32460
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32654
Forecasting of high voltage insulation performance: Testing of recommended potting materials and of capacitors
[NASA-TM-85536] N84-32681
The ionization structure of planetary nebulae V NGC 3242
[NASA-CR-173914] N84-33322
Atomic resonance and scattering N84-33339
IONIZATION CHAMBERS
High energy physics research at Texas Agriculture and Mining University --- magnetic monopoles in cosmic rays and hadron calorimeter design
[DE84-011616] N84-33167
IONIZING RADIATION
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32654
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995
IONOSPHERE
High frequency radar software reference manual for product one
[PB84-194885] N84-32665
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957
IONOSPHERIC DISTURBANCES
Intensity of radiowave scattering on anisotropic irregularities with various positions of scattering volume about caustic zone N84-32585
IONOSPHERIC PROPAGATION
Intensity of radiowave scattering on anisotropic irregularities with various positions of scattering volume about caustic zone N84-32585
HF prediction using adiabatic invariant theory
[AD-A143239] N84-32652
IONS
Modified Thomson parabola ion spectrometers for use in laser generated plasma experiments
[AD-A143298] N84-33190
IRON
Generalization of results of electro-simulation of temperature of the piece during centrifugal cladding
[BLL-M-35687-(5828.4)] N84-32479
Determination of thermodynamic characteristics of the barium dissolution process in liquid iron
[BLL-M-35634-(5828.4)] N84-32481
Influence of choice of pair-interaction potential on results of modelling an edge dislocation in Alpha-iron
[BLL-M-35682-(5828.4)] N84-32499
Theoretical research program to predict the properties of molecules and clusters containing transition metal atoms
[NASA-CR-173924] N84-32502
Thermal management of a lithium/iron-sulfide battery
[DE84-013438] N84-32722
Geology and origin of the Aquila iron deposit in southwestern Michoacan, Mexico N84-32890
Negative electrode catalyst for the iron-chromium REDOX energy storage system
[NASA-CASE-LEW-14028-1] N84-32909
IRON ALLOYS
Fundamental alloy studies
[DE84-013941] N84-32513
Ferrous alloy metallurgy, liquid lithium corrosion and welding
[DE84-014656] N84-32517
Aircraft landing dynamics facility carriage weld test program
[NASA-TM-85802] N84-32627
IRON ISOTOPES
Obtaining iron-55 with high radiochemical purity
[CSIR-TRANS-1751] N84-32494
IRRADIANCE
The effect of dimensionality on solar spectrum curves
[DE84-014136] N84-33327
ISENTROPIC PROCESSES
Altering the volumetric expansion ratio of a Lysholm helical screw expander
[DE84-013695] N84-32573
Empirical modeling of a Lysholm helical screw expander
[DE84-013694] N84-32574
ISOPARAMETRIC FINITE ELEMENTS
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
ITERATION
High-order sparse factorization methods for elliptic boundary value problems
[DE84-012582] N84-33122
ITERATIVE NETWORKS
Test procedures and design methods for reliable large scale integrated circuits and systems
[AD-A143324] N84-33061
ITERATIVE SOLUTION
High-order sparse factorization methods for elliptic boundary value problems
[DE84-012582] N84-33122

J

J INTEGRAL
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue
[NASA-CR-174686] N84-32503
JAHN-TELLER EFFECT
Supersonic metal cluster beams
[DE84-012976] N84-32516
JAMMING
Radio frequency distribution assembly
[AD-A143575] N84-32658
Cascaded adaptive loops
[AD-D011116] N84-32674
JET AIRCRAFT
Minimum-fuel, 3-dimensional flightpath guidance of transfer jets
[NASA-TP-2326] N84-32394
JET ENGINE FUELS
Carbon-13 and proton nuclear magnetic resonance analysis of shale-derived refinery products and jet fuels and of experimental referee broadened-specification jet fuels
[NASA-CR-174761] N84-32552
JET ENGINES
Economic use of CBN grinding tools in the production of jet turbine components
[CSIR-TRANS-1736] N84-32561
JET LAG
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-018] N84-32996
Pilot jet lag experiments described N84-32997
JOINTS (JUNCTIONS)
Foldable self-erecting joint --- space erectable structures
[NASA-CASE-MSC-20635-1] N84-32424
Compact broadband rectangular to coaxial waveguide junction
[AD-D011091] N84-32716
Nonlinear elastic stability analysis of plane frames N84-32853
Systematic jointing in the cardium sandstone along the Bow River, Alberta, Canada N84-32937
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11534-1] N84-33021
JOSEPHSON JUNCTIONS
Josephson point contacts noise properties at microwave N84-32602
Method for making Josephson junctions with contamination-free interfaces utilizing a ZNO contact insulator
[AD-D011057] N84-32671
JP-5 JET FUEL
Liquid and solid phase compositions in a partially frozen jP-5 fuel low in n-alkanes
[AD-A143390] N84-32553
JUPITER RINGS
Trapped particle absorption by the Ring of Jupiter
[NASA-CR-173919] N84-33323

K

KALMAN FILTERS
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372
Air data position-error calibration using state reconstruction techniques
[NASA-TM-86029] N84-32384
KAPITZA RESISTANCE
Dynamics of normal-zone propagation in Ta at small currents
[DE84-009990] N84-33245
KELVIN-HELMHOLTZ INSTABILITY
Simulation of the Kelvin-Helmholtz instability of a supersonic slip surface with the Piecewise-Parabolic Method (PPM)
[DE84-013219] N84-32768
KEROGEN
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
KEVLAR (TRADEMARK)
Textile ballistic performance (data base)
[AD-A143249] N84-32541
KINETIC ENERGY
Effects of insulin and hydrocortisone on energy metabolism in rats irradiated with fast, 60 MeV neutrons N84-33002
KINETIC FRICTION
Transient response dynamic module modifications to include static and kinetic friction effects N84-32872
KINETICS
Kinetics and mechanisms of thermolytic interconversions of boron hydrides
[AD-A143525] N84-32455
Recent developments in thermoluminescence kinetics
[DE84-013226] N84-32457
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts N84-32996
KLYSTRONS
A 1-dimensional disk model simulation for klystron design
[DE84-013793] N84-32727
KOLMOGOROFF THEORY
Kolmogorov's and Mourier's strong laws for arrays with independent and identically distributed columns
[AD-A143222] N84-33139

L

L-1011 AIRCRAFT
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173880] N84-32395
LAGRANGE MULTIPLIERS
Least-squares smoothing of direct-exchange in zonal analysis
[DE84-002612] N84-32770
LAMINAR BOUNDARY LAYER
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197995] N84-32773
LAMINAR FLOW
High-efficiency particulate air filter behavior at high-speed flows
[DE84-014137] N84-32769
LAMINAR MIXING
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers
[AD-A143319] N84-32959
LAMINATES
Hygrothermal effects on mechanical behavior of graphite/epoxy laminates beyond initial failure
[NASA-TM-86001] N84-32438
A simple rectangular element for 2-dimensional analysis of laminated composites
[NASA-TM-86291] N84-32439
Intermodulation product levels in flame-sprayed materials N84-32629
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
Opening of an interface flaw in a layered elastic half-plane under compressive loading
[NASA-TM-86282] N84-32877

LAND
Alaska Land Conveyance Program: A slow, complex and costly process
[PB84-207265] N84-33294
LAND MANAGEMENT
Alaska Land Conveyance Program: A slow, complex and costly process
[PB84-207265] N84-33294
LAND MOBILE SATELLITE SERVICE
Spectrum resource assessment in the 162-174 MHz frequency band — land mobile communications
[PB84-210244] N84-32667
LANDFORMS
Stratigraphy and sedimentology of the upper Proterozoic Kingston Peak Formation, Panamint Range, eastern California N84-32939
LANDING GEAR
Validation of an Active Gear, Flexible Aircraft Take-off and Landing analysis (AGFATL)
[NASA-TP-2353] N84-32378
LANDSAT SATELLITES
The compression of digital imagery by transformation
[INPE-2693-PRE/412] N84-33073
LANGUAGE PROGRAMMING
ADA (trademark) training curriculum. Basic ADA programming [202 teacher's guide, volume 1
[AD-A143564] N84-33083
LARGE SCALE INTEGRATION
Multi-valued LSI/VLSI logic design N84-32670
Programmable arithmetic logic unit
[AD-D011128] N84-33055
The Blue CHIP Project
[AD-A143474] N84-33065
LARGE SPACE STRUCTURES
The Telecommunications and Data Acquisition Report
[NASA-CR-173685] N84-32622
LASER ANEMOMETERS
Investigation of the three-dimensional flow field within a transonic fan rotor: Experiment and analysis
[NASA-TM-83730] N84-32357
LASER APPLICATIONS
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651
Developing turbulent flow in a 180(0) curved pipe and its downstream tangent
[DE84-013391] N84-32767
Laser furnace technology for zone refining
[NASA-TM-86459] N84-32805
Laser physics and laser techniques
[AD-A143538] N84-32809
Wafer-scale laser pantography. Part 6: Direct-write interconnection of VLSI gate arrays
[DE84-012676] N84-32815
Dynamic testing of NOVA laser structural systems. The north side of Spaceframe Tower
[DE84-014830] N84-32816
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172
Molecule microscopy N84-33337
LASER CAVITIES
Interferometrically tuned laser resonator
[AD-D011125] N84-32800
LASER CUTTING
French firm uses unique flexible workshop with laser cutter N84-33143
LASER DAMAGE
Eye safe laser transmitter
[AD-D011145] N84-32779
LASER DOPPLER VELOCIMETERS
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 2: Laser velocimeter data
[NASA-CR-168234-VOL-2] N84-33149
LASER FUSION
Wide spectrum antireflective coating for laser fusion systems
[DE84-013211] N84-32814
LASER HEATING
Supersonic metal cluster beams
[DE84-012976] N84-32516
LASER MATERIALS
Replication of high power laser mirrors
[AD-D011140] N84-33177
LASER MODES
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32806
Dynamic testing of NOVA laser structural systems. The north side of Spaceframe Tower
[DE84-014830] N84-32816
LASER OUTPUTS
Pulsed hydrogen-fluoride laser
[MRL-R-831] N84-32803
Practical problems with CO2 laser radar tests
[RAE-TRANS-2113] N84-32804
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32806
Visible and near-infrared dissociation lasers
[AD-A143295] N84-32807
Laser beam duct pressure controller system
[AD-D011102] N84-32811
Beam recombination via cylindrical mirror
[AD-D011104] N84-32812
Laser utilizing a gaseous lasing medium and method for operating the same
[DE84-014500] N84-32819
Evaluation and control of laser hazards N84-33018
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160
Optical distortion analyzer system
[AD-D011127] N84-33176
LASER PLASMAS
Modified Thomson parabola ion spectrometers for use in laser generated plasma experiments
[AD-A143298] N84-33190
LASER RANGE FINDERS
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32806
LASER SPECTROSCOPY
Laser physics and laser techniques
[AD-A143538] N84-32809
LASER WELDING
Heat transfer, fluid flow and element vaporization in laser welding
[DE84-011783] N84-32839
West Europe report: Science and technology
[JPRS-WST-84-030] N84-33141
Sweden: Optical fiber carries laser power for welding N84-33144
LASERS
Laser physics and laser techniques
[AD-A143538] N84-32809
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Evaluation and control of laser hazards N84-33018
Plasma dynamics N84-33354
LASING
Laser utilizing a gaseous lasing medium and method for operating the same
[DE84-014500] N84-32819
Visual function and the definition of thresholds for exposure to laser radiation N84-33019
LATHES
Design of a high-performance slide and drive system for a small precision machining research lathe
[DE84-011059] N84-32845
LATTICES
The least squares lattice algorithm: An alternate derivation with a discussion of numerical conditioning
[AD-A143439] N84-33114
LATTICES (MATHEMATICS)
Radial distribution function as an analysis technique
[DE84-013242] N84-33235
LAUNCHING SITES
Seismic hazard study for selected sites in New Mexico and Nevada
[AD-A143392] N84-32960
LAW (JURISPRUDENCE)
Economic cases of the Civil Aeronautics Board, volume 104, October - November 1983
[PB84-209287] N84-32370
LAWS
Legislation needed to clarify future of consumer protection and federal preemption after the Civil Aeronautics Board sunsets
[PB84-210103] N84-32371
LAYOUTS
Three-dimensional circuit layouts
[AD-A143430] N84-32713
LEAD ACID BATTERIES
Analysis of lead-acid battery deep-cycle accelerated testing data
[DE84-013192] N84-32736
LEAD COMPOUNDS
Anomalous pressure dependence of dipolar relaxation times in rare earth doped lead fluoride
[AD-A143201] N84-33215
LEAD TELLURIDES
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors
[INPE-3045-TDL/157] N84-33212
LEADERSHIP
Determination of factors affecting performance and productivity in an engineering/design environment
[AD-A143315] N84-33252
LEAKAGE
Altering the volumetric expansion ratio of a Lysholm helical screw expander
[DE84-013695] N84-32573
Empirical modeling of a Lysholm helical screw expander
[DE84-013694] N84-32574
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32850
LEARNING
An exploratory analysis of the relationship between media richness and managerial information processing
[AD-A143503] N84-33293
LEAST SQUARES METHOD
The least squares lattice algorithm: An alternate derivation with a discussion of numerical conditioning
[AD-A143439] N84-33114
Bounded-influence inference in regression
[AD-A143195] N84-33126
LENGTH
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32654
LETHALITY
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995
Modeling of lethal electric shock N84-33000
LIBRARIES
The role of the state library agency in the future: A Delphi study N84-33258
Predictions of satisfaction with automated library circulation systems N84-33259
A study of the extent of automation in small college libraries and relationships of attitudes of library directors toward it N84-33260
Goals and activities of the National Commission on Libraries and Information Science
[ISSN-0091-2972] N84-33262
A decade of accomplishment
[ISSN-0091-2972] N84-33263
LIE GROUPS
The Fourier Plancherel transform for Lie groups. 2: Nilpotent groups N84-33026
Non-degenerescence of some spectral sequences N84-33027
An extension of deLeeuw's theorem to the N-dimensional rotation group N84-33046
LIFE (DURABILITY)
Improved heat exchanger for electrothermal devices
[NASA-CASE-LEW-14037-1] N84-32425
Characterization of physiochemical properties of polymeric and electrochemical materials for aerospace flight
[NASA-CR-175256] N84-32534
LIFE CYCLE COSTS
Stand-alone flat-plate photovoltaic power systems: System sizing and life-cycle costing methodology for Federal agencies
[NASA-CR-173903] N84-32922
LIFE SCIENCES
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-016] N84-32996
LIFE SUPPORT SYSTEMS
Development of engineering prototype of Life Support Module (LSM)
[NASA-CR-171806] N84-33023
LIFT DRAG RATIO
Design of a composite wing extension for a general aviation aircraft
[NASA-CR-173832] N84-32377
LIGHT BEAMS
Target for optically activated seekers and trackers
[AD-D011059] N84-33171
LIGHT EMISSION
Optical spectroscopy of disordered materials and X-ray scattering from surfaces N84-33345
LIGHT EMITTING DIODES
Light-emitting diode matrix flat screen N84-32592
Visual field perimeter and psychomotor tracking performance measuring apparatus
[AD-D011056] N84-32776
LIGHT SCATTERING
Photon correlation spectroscopy and applications N84-33352
LIGHT SOURCES
Evaluation of the limiting accuracy in determining the coordinates of a point light source by a television tracking system using an image dissector with the presence of a nonstationary current component N84-32613
LIGHT SPEED
Quantum optics and photonics N84-33344
LIGHT TRANSMISSION
Target for optically activated seekers and trackers
[AD-D011059] N84-33171
Optical power source control system
[AD-D011124] N84-33175
Quantum optics and photonics N84-33344

LIGHTNING
Lightning swept-stroke attachment patterns and flight conditions for storm hazards 1981 [NASA-TM-86279] N84-32365
Mesoscale observations of lightning from Space Shuttle [NASA-TM-86451] N84-32768
LIMITS (MATHEMATICS)
On the boundary limits of harmonic functions with gradient in L sup p N84-33030
A methodology for the distribution of databases N84-33265
LINE OF SIGHT
Passive line-of-sight stabilization for an infrared sensor [AD-A143305] N84-32792
LINE SPECTRA
Submillimeter, millimeter, and microwave spectral line catalogue [NASA-CR-173899] N84-32448
Relation of vertical intensity profiles for neutral atom lines to analyte atomization behavior in inductively coupled plasmas [DE84-014126] N84-33194
Observations of the ultraviolet spectra of helium (DB) white dwarfs and a study of the ultraviolet spectra of white dwarfs containing carbon [NASA-CR-173889] N84-33310
The ionization structure of planetary nebulae V NGC 3242 [NASA-CR-173914] N84-33322
Identification of gamma-ray lines observed from SS433 [DE84-013829] N84-33335
LINEAR ACCELERATORS
Present status and probable future capabilities of heavy-ion linear accelerators [DE84-011741] N84-33158
Experimental investigation of certain beam transport issues in a pulsed transmission line linear accelerator [DE84-011191] N84-33164
LINEAR EQUATIONS
An integral equation for the solution of nonlinear wave equations N84-32347
Use of the tensor product for numerical weather prediction by the finite element method, part 1 [AD-A143273] N84-32970
Singularities connected with a trace on a Banach algebra N84-33034
High-order sparse factorization methods for elliptic boundary value problems [DE84-012582] N84-33122
LINEAR PREDICTION
Evaluation of the limiting accuracy in determining the coordinates of a point light source by a television tracking system using an image dissector with the presence of a nonstationary current component N84-32613
LINEAR PROGRAMMING
Duality in inexact fractional programming with set-inclusive constraints [DE84-023584] N84-33092
LINEAR SYSTEMS
Thermally induced instabilities of two-layer fluid systems N84-32745
A finite element implementation of the dual variable method for the Navier-Stokes equations N84-32746
Stability analysis of finite difference schemes for hyperbolic systems, and problems in applied and computational linear algebra [AD-A143537] N84-33119
LINEARITY
Linear motion valve [NASA-CASE-MSC-20148-1] N84-32823
Bounded-influence inference in regression [AD-A143195] N84-33126
Development of a spectroradiometer with a linear network of detectors from standard CCD [INPE-3095-TDL/165] N84-33180
LINES OF FORCE
Magnetic fluorescent lamp [DE84-014231] N84-32740
LINGUISTICS
Speech communication N84-33358
Linguistics N84-33359
LIOUVILLE EQUATIONS
Implicit function method for the Liouville equation [DE84-013282] N84-33140
LIQUEFIED NATURAL GAS
Liquified natural gas densities: Summary of research program at the National Bureau of Standards [PB84-202647] N84-33297
LIQUID CHROMATOGRAPHY
Multivariate curve resolution in liquid chromatography [DE84-013797] N84-32466
LIQUID CRYSTALS
Optical spectroscopy of disordered materials and X-ray scattering from surfaces N84-33345
LIQUID HELIUM
Period-doubling 2-torus state in a convecting He-3-superfluid He-4 solution [DE84-009985] N84-33243
Onset of oscillations in symmetric convective states in a superfluid He-3-He-4 mixture [DE84-009984] N84-33244
Dynamics of normal-zone propagation in Ta at small currents [DE84-009990] N84-33245
LIQUID HELIUM 2
Superfluid helium 2 liquid-vapor phase separation: Technology assessment [NASA-TM-85986] N84-32752
LIQUID INJECTION
Supersonic flows around a circular cone with or without blowing on the surface [AD-A143258] N84-32362
LIQUID LITHIUM
Ferrous alloy metallurgy, liquid lithium corrosion and welding [DE84-014656] N84-32517
LIQUID METAL FAST BREEDER REACTORS
Sloshing response of a reactor tank with internals [DE84-009629] N84-32766
LIQUID METALS
A diffusion mechanism in the catalytic conversion of carbonaceous materials into diamonds at high pressures [CSIR-TRANS-1743] N84-32526
Friction and wear studies of liquid metal wetted, metallic fiber brushes [AD-A143473] N84-32631
LIQUID PHASES
Microstructural development and control in liquid phase sintering; processing, structures and properties of cold worked metal matrix composites [AD-A143188] N84-32509
Liquid and solid phase compositions in a partially frozen JP-5 fuel low in n-alkanes [AD-A143390] N84-32553
Superfluid helium 2 liquid-vapor phase separation: Technology assessment [NASA-TM-85986] N84-32752
LIQUID PROPELLANT ROCKET ENGINES
Rocket injector anomalies study. Volume 2: Results of parametric studies [NASA-CR-174703] N84-32429
LIQUID SLOSHING
Sloshing response of a reactor tank with internals [DE84-009629] N84-32766
LIQUIDS
Carbon-13 and proton nuclear magnetic resonance analysis of shale-derived refinery products and jet fuels and of experimental referee broadened-specification jet fuels [NASA-CR-174761] N84-32552
LITHIUM
Thermal management of a lithium/iron-sulfide battery [DE84-013438] N84-32722
LITHIUM ALLOYS
Lithium-alloy/metal sulfide battery research [DE84-013427] N84-32720
LITHIUM CHLORIDES
Electrochemical performance of porous nickel sulfide electrodes [DE84-009586] N84-32741
LITHIUM FLUORIDES
Electrochemical performance of porous nickel sulfide electrodes [DE84-009586] N84-32741
LITHIUM HYDRIDES
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition [AD-A143361] N84-33219
LITHIUM SULFUR BATTERIES
Ampule tests to simulate glass corrosion in ambient temperature lithium batteries, volume 2 [DE84-014330] N84-32732
LOADS (FORCES)
Development of 2 underseat energy absorbers for application to crashworthy passenger seats for general aviation aircraft [NASA-CR-158927] N84-32367
Failure analysis of a graphite/epoxy laminate subjected to bolt bearing loads [NASA-TM-86297] N84-32436
Simplifications in the simulation of mechanisms containing flexible members N84-32655
On the mechanics of fatigue crack growth due to contact loading N84-32659
Crack problems for bonded nonhomogeneous materials under antiplane shear loading [NASA-CR-173892] N84-32663
Design spectrum analysis in NASTRAN N84-32670
Simple examples of non linear truss behavior [AD-A143368] N84-32682
Wind loading on solar concentrators: Some general considerations [NASA-CR-173896] N84-32915
LOCKING
Concurrency control using locks in distributed databases N84-33262
LOGARITHMS
Three-dimensional circuit layouts [AD-A143430] N84-32713
LOGIC CIRCUITS
High temperature electronics technology [AD-A143571] N84-32714
Test procedures and design methods for reliable large scale integrated circuits and systems [AD-A143324] N84-33061
LOGIC DESIGN
A simple algorithm for the metric traveling salesman problem N84-32631
Multi-valued LSI/VLSI logic design N84-32670
LOGISTICS MANAGEMENT
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1 [AD-A143248] N84-32630
LONGITUDINAL CONTROL
Development and flight evaluation of an augmented stability active controls concept with a small tail [NASA-CR-173880] N84-32395
LOSSES
Refueling considerations for liquid-hydrogen fueled vehicles [DE84-012623] N84-32557
A study of the high frequency limitations of series resonant converters [NASA-CR-173868] N84-32678
Characterization of voltage losses during high-intensity current pulses in reactive, porous electrodes of molten salt cells [DE84-012112] N84-32730
Thermal analysis of a planetary transmission with spherical roller bearings operating after complete loss of oil [NASA-TP-2367] N84-32624
LOUVERS
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner [NASA-CR-174691] N84-32504
LOW COST
Low cost thermal protection system processing [AD-D011142] N84-32434
LOW TEMPERATURE
Assessment of low-temperature geothermal resources of the United States, 1982 [DE84-007193] N84-32902
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films [DE84-013122] N84-33248
LOW TEMPERATURE TESTS
Low temperature evaluation of advanced technology hydraulic system (8,000 psi) [AD-A143389] N84-32396
LUBRICANT TESTS
Solid lubrication design methodology [NASA-CR-174690] N84-33309
LUBRICATING OILS
Method for the particle size independent spectrometric determination of metal particles in lubricating oils and hydraulic fluids [AD-D011121] N84-32445
Perfluoroalkylether substituted phenyl phosphines [AD-D011122] N84-32529
LUBRICATION
The chemical and physical changes on lubricated surfaces N84-32820
Certain assumptions of theory of hydrodynamic lubrication during metal pressure working [BLL-M-35661-(5826.4)] N84-32822
LUMINAIRES
Magnetic fluorescent lamp [DE84-014231] N84-32740
LUMINOSITY
Solar variability observed through changes in solar figure and mean diameter [DE84-013914] N84-33329
LUNAR CRATERS
Morphologic studies of the Moon and planets [NASA-CR-173866] N84-33319
A geographic comparison of selected large-scale planetary surface features [NASA-TM-86147] N84-33320

LUNAR SURFACE
Morphologic studies of the Moon and planets
[NASA-CR-173696] N84-33319
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320
LYSINE
Microbiology and food program N84-32999

M

MACH NUMBER
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door
[NASA-CR-171732] N84-32416
MACHINE TOOLS
Metal coating of diamond abrasives (review of foreign patents)
[CSIR-TRANS-1740] N84-32489
Forty years of development in diamond tools
[CSIR-TRANS-1730] N84-32564
New machines for grinding, facetting and profiling hard materials
[CSIR-TRANS-1750] N84-32621
MACHINING
Economic use of CBN grinding tools in the production of jet turbine components
[CSIR-TRANS-1736] N84-32561
Machined two-piece microwave waveguide
[AD-D011088] N84-32715
Design of a high-performance slide and drive system for a small precision machining research lathe
[DE84-011059] N84-32845
MAGELLANIC CLOUDS
Ultraviolet interstellar absorption toward stars in the small Magellanic cloud N84-33313
MAGNESIUM
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314
MAGNESIUM CHLORIDES
Chromium-magnesium stainless steels, resistant to stress corrosion cracking in magnesium and calcium chloride solutions
[BLL-RISLEY-TRANS-4571-(9091.9)] N84-32477
MAGNESIUM ISOTOPES
Identification of gamma-ray lines observed from SS433
[DE84-013829] N84-33335
MAGNET COILS
Method and apparatus for making superconductive magnet coils
[DE84-014510] N84-32737
MAGNETIC ANOMALIES
MAGSAT correlations with geoid anomalies — magnetic anomalies in the western Gulf of Mexico
[E84-10190] N84-32894
Mapping magnetized geologic structures from space: The effect of orbital and body parameters
[E84-10191] N84-32895
Quantitative interpretation of aeromagnetic anomalies in the Sinclinal Gandarela
[INPE-3070-PRE/487] N84-32896
Dynamic model of the Earth's upper atmosphere
[NASA-CR-3835] N84-32965
MAGNETIC CIRCUITS
Magnetic switches and circuits, revision 2
[DE84-014141] N84-32725
MAGNETIC COMPRESSION
Magnetic switches and circuits, revision 2
[DE84-014141] N84-32725
MAGNETIC COOLING
Magnetic refrigeration development N84-32626
MAGNETIC FIELD CONFIGURATIONS
Physics issues in mirror and tandem mirror systems
[DE84-013637] N84-33201
MAGNETIC FIELDS
Broadside radar cross section of the perfectly conducting cube
[AD-A143321] N84-32656
Pulsed power for racetrack induction accelerators
[AD-A143289] N84-33157
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
Influence of magnetic shear on the collisional current driven ion cyclotron instability
[AD-A143391] N84-33191
Quantum transport in low dimensional disordered systems N84-33347
MAGNETIC MEASUREMENT
Mapping magnetized geologic structures from space: The effect of orbital and body parameters
[E84-10191] N84-32895
MAGNETIC MONOPOLES
High energy physics research at Texas Agriculture and Mining University — magnetic monopoles in cosmic rays and hadron calorimeter design
[DE84-011616] N84-33167
MAGNETIC PROPERTIES
Producing thermomagnetic alloy by powder metallurgy
[BLL-M-35668-(5828.4)] N84-32500
MAGNETIC RESONANCE
Microwave and quantum magnetics N84-33348
MAGNETIC STORMS
Particle environment — solar arrays and electric discharges
[NASA-CR-173668] N84-33210
MAGNETIC SUSPENSION
Engineering changes to the 0.1m cryogenic wind tunnel at Southampton University
[NASA-CR-172430] N84-32397
MAGNETOHYDRODYNAMIC STABILITY
Influence of magnetic shear on the collisional current driven ion cyclotron instability
[AD-A143391] N84-33191
Reliability of initial-value MHD calculations of Tokamak disruptions
[DE84-013600] N84-33193
Accelerated convergence of the steepest-descent method for magnetohydrodynamic equilibria
[DE84-013602] N84-33195
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013661] N84-33196
MAGNETOMETERS
Pulse driver for flux gate magnetometer
[AD-D011053] N84-32774
MAGNETORESISTIVITY
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
MAGNETOSPHERE
Geometrical relationships of Pioneer 11 to Uranus and Voyager 2 in 1985-86
[NASA-CR-173675] N84-32406
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946
A determination of the charge state of energetic magnetospheric ions by the observation of drift echoes
[AD-A143181] N84-32954
MAGNETOSTATICS
Microwave and quantum magnetics N84-33348
MAGNETOSTRICTION
Fiber optic magnetometer for the detection of dc magnetic fields without hysteretic ambiguity
[AD-D011085] N84-32794
MAGNETRONS
Plasma dynamics N84-33354
MAINTAINABILITY
An evaluation of two reliability and maintainability information systems
[AD-A143438] N84-33290
MAINTENANCE
Preliminary guidelines for maintenance of polyurethane foam (PUF) roofing systems
[AD-A143458] N84-32543
Investigation and rehabilitation to extend service life of DSS-13 antenna concrete foundation N84-32637
Prolonging the life of software
[DE84-001722] N84-33088
Programmer productivity aid catalog
[PB84-212166] N84-33095
MALES
Oxygen affinity of hemoglobin, 3 hours after passive increase in altitude from 400 to 1800 metres
[RAE-TRANS-2118] N84-33004
MAN MACHINE SYSTEMS
Battery Computer System (BCS) human factors field evaluation
[AD-A143425] N84-33062
Programming productivity enhancement by the use of application generators
[AD-A143532] N84-33080
MANAGEMENT
Voluntary accounting systems for a small air carrier: Revenues, financial and traffic statistics
[PB84-210996] N84-32369
MANAGEMENT INFORMATION SYSTEMS
Programming productivity enhancement by the use of application generators
[AD-A143532] N84-33080
NASA Administrative Data Base Management Systems, 1984
[NASA-CP-2323] N84-33266
Effective organizational solutions for implementation of DBMS software packages N84-33268
Administrative automation in a scientific environment N84-33269
The administrative window into the integrated DBMS N84-33270
A user view of office automation or the integrated workstation N84-33271
Langley experience with ADABAS/NATURAL N84-33272
Strip and load data N84-33273
NASA metrology information system: A NEMS subsystem N84-33278
Langley's views on NEMS N84-33280
An evaluation of two reliability and maintainability information systems
[AD-A143436] N84-33290
An exploratory analysis of the relationship between media richness and managerial information processing
[AD-A143503] N84-33293
MANAGEMENT PLANNING
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1
[AD-A143248] N84-32830
Determination of factors affecting performance and productivity in an engineering/design environment
[AD-A143315] N84-33252
Matrix management in DoD: An annotated bibliography
[AD-A143316] N84-33253
Analysis of benefits realized from multiyear contracting for the Black Hawk helicopter
[AD-A143485] N84-33254
The role of the state library agency in the future: A Delphi study N84-33258
Effective organizational solutions for implementation of DBMS software packages N84-33268
MANGANESE ALLOYS
Fundamental alloy studies
[DE84-013941] N84-32513
MANIFOLDS (MATHEMATICS)
Non-degeneresence of some spectral sequences N84-33027
MANUALS
High frequency radar software reference manual for product one
[PB84-194885] N84-32685
Flight systems raster graphics software reference manual
[ARL-SYS-TM-72] N84-33072
MANUFACTURING
Sintered hard metal alloys and process for their manufacture
[CSIR-TRANS-1748] N84-32493
Ceramic component manufacturing technology development — silicon carbide tubing for industrial waste heat recovery
[PB84-215276] N84-32550
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1
[AD-A143248] N84-32830
MAPPING
Tropospheric delay effects in radio interferometry N84-32636
Microwave terrestrial link rain attenuation prediction parameter analysis
[PB84-207984] N84-32666
Manual and automated line generalization and feature displacement
[AD-A143250] N84-32900
Harmonic maps from S-2 to IHP-2 N84-33109
Symbolic dynamics and nonlinear semiflows
[AD-A143487] N84-33117
MAPS
Manual and automated line generalization and feature displacement
[AD-A143250] N84-32900
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States
[DE84-013672] N84-32901
Harmonic maps from S-2 to IHP-2 N84-33109
MARINE ENVIRONMENTS
Topographic effects of the Alaskan stream on shelf currents
[PB84-205137] N84-32988
MARINE METEOROLOGY
Mariners Weather Log, Volume 28, Number 2, April-May-June 1984
[PB84-204569] N84-32978
MARINE TECHNOLOGY
Quick Deployment Vehicle (QDV)
[AD-D011060] N84-32563
MARITIME SATELLITES
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 1: System description and test results
[PB84-184621] N84-32412

Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 2: Hardware circuitry and software programs
[PB84-184639] N84-32413

MARKETING
Module utilization committee
[NASA-CR-173898] N84-32920
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1986
[NASA-CR-173897] N84-33213

MARKOV PROCESSES
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers
[AD-A143318] N84-32655

MARS (PLANET)
Morphologic studies of the Moon and planets
[NASA-CR-173886] N84-33319
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

MARS CRATERS
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

MARS SURFACE
Morphologic studies of the Moon and planets
[NASA-CR-173886] N84-33319
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

MARYLAND
Historical and projected shoreline changes: Ocean City and north Assateague Island, Maryland
[PB84-190206] N84-32987

MASERS
Magnetic refrigeration development N84-32626

MASS SPECTROMETERS
Molecular beam mass spectrometer sampling of flash ignited combustion
[DE84-006771] N84-32459

MASS SPECTROSCOPY
Kinetics and mechanisms of thermolytic interconversions of boron hydrides
[AD-A143525] N84-32455
Basic problems in InP technology
[AD-A143456] N84-33222

MASS TRANSFER
Mass transfer from a circular cylinder: Effects of flow unsteadiness and slight nonuniformities
[NASA-CR-174759] N84-32751
Dynamics of heat, mass and momentum transfer in an inductively coupled plasma
[DE84-013499] N84-33200

MATERIALS
Crack problems for bonded nonhomogeneous materials under antiplane shear loading
[NASA-CR-173892] N84-32663

MATERIALS HANDLING
Adjustable self-releasing hook
[AD-D011062] N84-32834
Conceptual design of a monitoring system for the Charters of Freedom
[NASA-CR-173909] N84-33285

MATERIALS SCIENCE
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535

MATHEMATICAL LOGIC
Using statistical tools
[RAND/N-2121-PSSP] N84-33124

MATHEMATICAL MODELS
Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351
A mathematical simulation model of the CH-46B helicopter, volume 2
[NASA-TM-84351] N84-32360
Rocket injector anomalies study. Volume 1: Description of the mathematical model and solution procedure
[NASA-CR-174702] N84-32426
Mathematical model of electrostatic precipitation (revision 3). Volume 1: Modeling and programming
[PB84-212679] N84-32469
Mathematical model of electrostatic precipitation (revision 3). Volume 2: User's manual
[PB84-212687] N84-32470
Numerical calculations of the function of the static receptivity of electrons in metals
[BLL-M-35640-(5826.4)] N84-32480
Textile ballistic performance (data base)
[AD-A143249] N84-32541
Empirical modeling of a Lysholm helical screw expander
[DE84-013694] N84-32574
NASTRAN structural model for the large 64-meter antenna pedestal. Part 3: Applications to hydrostatic bearing oil film N84-32636
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651
HF prediction using adiabatic invariant theory
[AD-A143239] N84-32652
Analysis, testing, and evaluation of faulted and unfaulted Wye, Delta, and open Delta connected electromechanical actuators
[NASA-CR-171808] N84-32707
Thermally induced instabilities of two-layer fluid systems N84-32745
The structure of the vorticity field in turbulent channel flow. Part 1: Analysis of instantaneous fields and statistical correlations
[NASA-TM-86019] N84-32753
Developing turbulent flow in a 180(0) curved pipe and its downstream tangent
[DE84-013391] N84-32767
Retardation analytical model to extend service life
[NASA-CR-173891] N84-32862
Two-dimensional finite amplitude mountain waves in the presence of moisture N84-32947
Duality in inexact fractional programming with set-inclusive constraints
[DE84-023584] N84-33092
Controller technique of compensation figured in an active control scheme on the accumulated effects of deviation in the modeling
[INPE-2987-TDL/152] N84-33100
Quasiconformal mappings and grid generation
[NASA-CR-173920] N84-33105
Robust C(Alpha)-type tests for linear models
[AD-A143177] N84-33125
Inelastic strong interactions at high energies
[DE84-013847] N84-33170
The allocation of data and programs in distributed data processing environments N84-33261
Liquified natural gas densities: Summary of research program at the National Bureau of Standards
[PB84-202647] N84-33297
Possible cosmological origin of the ultra high energy cosmic rays
[DE84-013063] N84-33334

MATHEMATICS
Annals of the Fourier Institute, volume 34, no. 2
[ISSN-0373-0956] N84-33038

MATRICES (MATHEMATICS)
Use of the tensor product for numerical weather prediction by the finite element method, part 1
[AD-A143273] N84-32970
Distribution results for positive definite quadratic forms with repeated roots
[AD-A143450] N84-33115
Stability analysis of finite difference schemes for hyperbolic systems, and problems in applied and computational linear algebra
[AD-A143537] N84-33119

MATRIX MANAGEMENT
Matrix management in DoD: An annotated bibliography
[AD-A143316] N84-33253

MATRIX THEORY
Relationships among classes of spherical matrix distributions
[AD-A143215] N84-33128

MAXIMUM ENTROPY METHOD
An entropy maximum principle and relaxation phenomena
[AD-A143531] N84-33250

MAXIMUM LIKELIHOOD ESTIMATES
Bounded-influence inference in regression
[AD-A143195] N84-33126

MAXIMUM PRINCIPLE
An entropy maximum principle and instantaneous failure statistics
[AD-A143299] N84-32851

MEASURE AND INTEGRATION
Algorithmic integration of elementary transcendental functions on an algebraic curve N84-33052

MEASURING INSTRUMENTS
On-site measurement of the speed of corrosion of a metal in water
[BLL-T6310/BG/WH770/84] N84-32488
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage
[DE84-012234] N84-32796
Method of measuring optical properties of a transparency
[AD-D011117] N84-33188
NASA metrology information system: A NEMS subsystem N84-33279
Langley's views on NEMS N84-33280

MECHANICAL DRIVES
Comparison between two Lysholm engines
[DE84-013696] N84-32571

MECHANICAL PROPERTIES
Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506
Mechanical property data 15-5PH (H1025) stainless steel alloy: Hot-rolled plate
[AD-A143327] N84-32510
Mechanical property data 7175-t736 aluminum alloy: Hand forging
[AD-A143328] N84-32511
Ferrous alloy metallurgy, liquid lithium corrosion and welding
[DE84-014656] N84-32517
Microstructure, mechanical properties and two-body abrasive wear resistance of an Fe-3Cr-C based ultra-high strength steel
[DE84-014605] N84-32520
Structure of polycrystalline boron nitride as determined by electron microscopic thin sections
[CSIR-TRANS-1738] N84-32533
Properties of UV-cured polyurethane acrylates: Effect of polyol type and molecular weight
[AD-A143176] N84-32537
Properties of UV-curable polyurethane acrylates: Effect of reactive diluent
[AD-A143241] N84-32540
Development of partially fluorinated resin apex seals
[NASA-CR-174706] N84-32828
Materials testing of the IUS techroll seal material
[NASA-TM-86462] N84-32829

MECHANIZATION
Manual and automated line generalization and feature displacement
[AD-A143250] N84-32900

MEDIA
Wave propagation in dense geophysical media
[AD-A143213] N84-32955
An exploratory analysis of the relationship between media richness and managerial information processing
[AD-A143503] N84-33293

MEDICAL SCIENCE
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-018] N84-32996
Notes for medical catalogers, 1983
[PB84-195874] N84-33296

MELTING
Resistance of microorganisms from mesosphere to periodic freezing-thawing N84-33001

MEMORY (COMPUTERS)
On the impact of communication complexity in the design of parallel numerical algorithms
[NASA-CR-172436] N84-33059

MERCURY (PLANET)
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

MERCURY ALLOYS
Theory of the electronic properties of mercury-cadmium-telluride alloys
[AD-A143426] N84-33221

MERCURY CADMIUM TELLURIDES
Physical properties of CdTe films grown by hotwall and molecular beam techniques
[AD-A143160] N84-33214

MESOPAUSE
Solar tides in the mesospheric sodium layer
[INPE-2942-TDL/151] N84-32953

MESOSPHERE
Resistance of microorganisms from mesosphere to periodic freezing-thawing N84-33001

MESSAGE PROCESSING
Random multiple access methods in multi-user communication systems N84-32616
Extending binary Byzantine agreement to multivalued Byzantine agreement
[AD-A143424] N84-33077

METABOLISM
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005

METAL COATINGS
Metal coating of diamond abrasives (review of foreign patents)
[CSIR-TRANS-1740] N84-32489
Effect of formation conditions and contact zone structure on adhesion strength of carbide forming metal coatings on diamond
[CSIR-TRANS-1735] N84-32492
Coatings on diamond and CBN abrasives (review of inventions)
[CSIR-TRANS-1742] N84-32525

METAL CRYSTALS
Laser furnace technology for zone refining
[NASA-TM-86459] N84-32605
Characterization of erosion of metallic materials under cavitation attack in a mineral oil
[NASA-TP-2369] N84-32825
METAL FIBERS
Friction and wear studies of liquid metal wetted, metallic fiber brushes
[AD-A143473] N84-32831
METAL FOILS
Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506
METAL GRINDING
Economical grinding of steel and sintered carbides using superhard abrasives and high temperature-resistant bonds
[CSIR-TRANS-1744] N84-32562
METAL IONS
Raman and infrared spectroscopy of molecules adsorbed on metal electrodes
[AD-A143466] N84-32454
METAL MATRIX COMPOSITES
Loss factors measured in metal matrix composite materials
[AD-A143542] N84-32440
Microstructural development and control in liquid phase sintering; processing, structures and properties of cold worked metal matrix composites
[AD-A143188] N84-32509
METAL OXIDE SEMICONDUCTORS
Research in monolithic, signal-processing circuits
[AD-A143204] N84-32709
Submicron structures technology and research N84-33353
METAL OXIDES
Chemical reaction dynamics at surfaces N84-33340
METAL PARTICLES
Method for the particle size independent spectrometric determination of metal particles in lubricating oils and hydraulic fluids
[AD-D011121] N84-32445
METAL POLISHING
Intermodulation product levels in flame-sprayed materials N84-32629
METAL SHEETS
French firm uses unique flexible workshop with laser cutter N84-33143
METAL SURFACES
Effect of surface doping on the oxidation of chromia former alloys
[DE84-013390] N84-33247
METAL WORKING
Certain assumptions of theory of hydrodynamic lubrication during metal pressure working
[BLL-M-35681-(5828.4)] N84-32822
METAL-METAL BONDING
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner
[NASA-CR-174691] N84-32504
METAL-NITRIDE-OXIDE-SILICON
Method for fabricating MNOS structures utilizing hydrogen ion implantation
[AD-D011123] N84-33206
METAL-WATER REACTIONS
Stress corrosion cracking of austenitic stainless steels in sea water: An investigation of test methods
[BLL-RISLEY-TRANS-4568-(9091.9)] N84-32478
On-site measurement of the speed of corrosion of a metal in water
[BLL-T6310/BG/WH770/84] N84-32488
METALLIC GLASSES
Microstructure and surface chemistry of amorphous alloys important to their friction and wear behavior
[NASA-TM-83762] N84-32508
METALLIZING
Intermodulation product levels in flame-sprayed materials N84-32629
High temperature electronics technology
[AD-A143571] N84-32714
METALLOGRAPHY
Method to reveal microstructures in single phase alloys
[AD-D011094] N84-32512
METAMORPHISM (GEOLOGY)
Geology, petrology and geochronology of the metamorphic rocks of Mesiq Dome, Central Eastern Desert, Egypt N84-32942
Crystalline rocks of the Northeastern United States
[DE84-013673] N84-32962
METEOROLOGICAL PARAMETERS
Bering Air-Sea-Ice Study (BASICS), February and March, 1981
[PB84-186161] N84-32903
METEOROLOGICAL RADAR
Thunderstorm impact on Denver air traffic control operations and the role of NEXRAD (Next Generation Weather Radar)
[PB84-189729] N84-32374
METEOROLOGICAL SERVICES
Agriculture weather services
[GPO-27-913] N84-32966
Hurricane Alicia: Prediction, damage and recovery efforts
[GPO-33-446] N84-32968
METEOROLOGY
Studies in climate
[PB84-196385] N84-32977
METHYL ALCOHOLS
Engine wear with methanol fuel in a nitrogen-free environment
[AD-A143530] N84-32833
METROLOGY
Langley's views on NEMS N84-33280
MEXICO
MAGSAT correlations with geoid anomalies — magnetic anomalies in the western Gulf of Mexico
[E84-10190] N84-32894
MICROANALYSIS
Epitaxial crystallization in the Te-HgTe-CdTe system
[CSIR-TRANS-1745] N84-33206
MICROBIOLOGY
Rapid microbial identification by circular intensity differential scattering
[DE84-013894] N84-32993
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-016] N84-32996
Microbiology and food program N84-32999
Resistance of microorganisms from mesosphere to periodic freezing-thawing N84-33001
MICROCOMPUTERS
Engineering changes to the 0.1m cryogenic wind tunnel at Southampton University
[NASA-CR-172430] N84-32397
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Microcomputers in transportation: Software and source book
[PB84-195155] N84-33067
MICROCRYSTALS
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246
MICROELECTRONICS
Superconductive films in microwave microelectronics (survey) N84-32604
Monolithic integrated antenna systems
[AD-A143184] N84-32708
Research in monolithic, signal-processing circuits
[AD-A143204] N84-32709
MICROHARDNESS
Chemical vapor deposition of erosion resistant TiB-2 coatings
[DE84-012351] N84-32518
MICROORGANISMS
Resistance of microorganisms from mesosphere to periodic freezing-thawing N84-33001
MICROPOROSITY
Features of behaviour of gas bubbles in molten oxide films during enamelling
[BLL-M-35672-(5828.4)] N84-32496
MICROPROCESSORS
Computer system for fiber creep testing
[DE84-014453] N84-32885
Test procedures and design methods for reliable large scale integrated circuits and systems
[AD-A143324] N84-33061
MECA: A supercomputer for Monte Carlo
[DE84-014129] N84-33066
Higher layer protocols for a workstation architecture
[DE84-013649] N84-33087
MICROPROGRAMMING
Programmable arithmetic logic unit
[AD-D011128] N84-33055
MICROSTRIP TRANSMISSION LINES
Superconductive films in microwave microelectronics (survey) N84-32604
Monolithic integrated antenna systems
[AD-A143184] N84-32708
Electromagnetic wave theory and remote sensing N84-33350
MICROSTRUCTURE
Creep transitions in aluminum solid-solution alloys N84-32472
Slavutich high-cobalt WC-Co-matrix alloy
[CSIR-TRANS-1739] N84-32490
Distribution of micro-heterogeneous deformation in C8Yu steel around inclusions during compression
[BLL-M-35641-(5828.4)] N84-32498
Microstructure and surface chemistry of amorphous alloys important to their friction and wear behavior
[NASA-TM-83762] N84-32508
Microstructural development and control in liquid phase sintering; processing, structures and properties of cold worked metal matrix composites
[AD-A143188] N84-32509
Method to reveal microstructures in single phase alloys
[AD-D011094] N84-32512
Microstructure, mechanical properties and two-body abrasive wear resistance of an Fe-3Cr-C based ultra-high strength steel
[DE84-014605] N84-32520
RF sputtered silicon and hafnium nitrides as applied to 440C steel
[NASA-TM-86862] N84-32536
Microstructural analysis for series 300 stainless steel sheet welds and tensile samples
[DE84-008513] N84-32837
The role of the reflection coefficient in precision measurement of ultrasonic attenuation
[NASA-TM-83788] N84-32849
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246
MICROWAVE ANTENNAS
Optimization of antenna structure design N84-32624
Intermodulation product levels in flame-sprayed materials N84-32629
Electromagnetic wave theory and remote sensing N84-33350
MICROWAVE ATTENUATION
Microwave terrestrial link rain attenuation prediction parameter analysis
[PB84-207984] N84-32686
MICROWAVE EMISSION
Microwave and X-ray observations of delayed brightenings at sites remote from the primary flare locations
[NASA-TM-86140] N84-33326
MICROWAVE EQUIPMENT
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Josephson point contacts noise properties at microwave N84-32602
Utilization of nonlinear properties of IMPATT-diodes in microwave devices (survey) N84-32603
Superconductive films in microwave microelectronics (survey) N84-32604
Machined two-piece microwave waveguide
[AD-D011088] N84-32715
Compact broadband rectangular to coaxial waveguide junction
[AD-D011091] N84-32716
High power microwave generator
[DE84-014230] N84-32738
MICROWAVE OSCILLATORS
Design of locked microwave oscillators on basis of scattering parameters of transistors operating in large signal mode N84-32608
Modulation of microwave power with electron transfer diodes N84-32610
MICROWAVE RADIOMETERS
The correction of aberrations computed in the aperture plane of multifrequency microwave radiometer antennas
[NASA-TM-86090] N84-32679
Determination of sea surface temperature with N-ROSS (Navy-Remote Ocean Sensing System)
[AD-A143563] N84-32984
MICROWAVE SPECTRA
Submillimeter, millimeter, and microwave spectral line catalogue
[NASA-CR-173899] N84-32448
MICROWAVE SWITCHING
The 20 x 20 high speed microwave switches
[NASA-TM-83775] N84-32644
MICROWAVE TRANSMISSION
Intermodulation distortions in semiconductor microwave receivers and transmitters (survey) N84-32605
A high-performance hybrid RF isolation amplifier N84-32623
Optimization of antenna structure design N84-32624
High power K sub a -band transmitter for planetary radar and spacecraft uplink N84-32625
Computer-based transmission monitor and control system
[PB84-202068] N84-33069
MICROWAVES
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580

Correlational estimation of parameters of solid state microwave devices N84-32609
Intermodulation in protective semiconductor microwave devices N84-32612
Mojave base station implementation N84-32643
Focusing twist reflector for electron-cyclotron resonance heating in the Tandem Mirror Experiment-upgrade [DE84-012954] N84-32683
Microwave and quantum magnetics N84-33348

MIDAIR COLLISIONS
Aircraft accident report. Midair collision: McDonnell-Douglas F-4C Beech D-55 Baron, Cherry Point, North Carolina, 9 January 1983 [PB84-910407] N84-32368

MILITARY OPERATIONS
The feasibility, practicality and utility of P-3 inflight refueling [AD-A143419] N84-32382
Rand's experience in applying artificial intelligence techniques to strategic-level military-political war gaming [P-6977] N84-33137
An evaluation of two reliability and maintainability information systems [AD-A143436] N84-33290

MILLIMETER WAVES
Submillimeter, millimeter, and microwave spectral line catalogue [NASA-CR-173899] N84-32448
Approximation models for electrodynamic systems in solid state millimetric wave devices N84-32606
Millimetric wave frequency converter using Gunn-effect diode N84-32607
Microwave and quantum magnetics N84-33348

MIMAS
A geographic comparison of selected large-scale planetary surface features [NASA-TM-86147] N84-33320

MINERAL DEPOSITS
Geology and origin of the Aquila iron deposit in southwestern Michoacan, Mexico N84-32890

MINERAL EXPLORATION
Remote sensing for geobotanical prospecting N84-32889

MINERAL METABOLISM
Effects of insulin and hydrocortisone on energy metabolism in rats irradiated with fast, 60 MeV neutrons N84-33002

MINERAL OILS
Characterization of erosion of metallic materials under cavitation attack in a mineral oil [NASA-TP-2368] N84-32825

MINERALOGY
Geology and origin of the Aquila iron deposit in southwestern Michoacan, Mexico N84-32890

MINICOMPUTERS
Asynchronous file transfer to IBM PC's N84-33275

MINIMAX TECHNIQUE
Seasonal precipitation forecasting with a 6 to 7 month lead time in the Pacific Northwest using an information theoretic model [PB84-207018] N84-32979

MINORITIES
NASA Ames summary high school apprenticeship research program, 1983 research papers [NASA-TM-85931] N84-33365

MIRROR FUSION
Physics issues in mirror and tandem mirror systems [DE84-013837] N84-33201

MIRRORS
Beam recombination via cylindrical mirror [AD-D011104] N84-32812
Replication of high power laser mirrors [AD-D011140] N84-33177
Observation of advanced particle removal rates in pump limiter simulation experiments [DE84-014327] N84-33202
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control [NASA-CR-173878] N84-33315

MISMATCH (ELECTRICAL)
A review and summary of cell and module mismatch losses from theoretical and experimental studies N84-32689

MIXTURES
Multivariate curve resolution in liquid chromatography [DE84-013797] N84-32466
Pastes of superhard materials (review of inventions) [CSIR-TRANS-1741] N84-32491

MODELS
Approximation models for electrodynamic systems in solid state millimetric wave devices N84-32606
Mechanisms involved in the glow-discharge deposition of doped hydrogenated amorphous silicon [DE84-013124] N84-33236
Model for GCR-particle fluxes in stony meteorites and production rates of cosmogenic nuclides [NASA-CR-173923] N84-33321
Speech communication N84-33358

MODES
Normal modes of the NCAR (National Center for Atmospheric Research) Community Forecast Model (CFM) [PB84-191220] N84-33094

MODULATION
INTERMD: A computer program to predict intermodulation product generation on two-way FM radio frequencies [DE84-013767] N84-32661

MODULATORS
Universal control grid modulator [AD-D011108] N84-32672

MODULES
A review and summary of cell and module mismatch losses from theoretical and experimental studies N84-32689
Development of engineering prototype of Life Support Module (LSM) [NASA-CR-171806] N84-33023

MOLECULAR ABSORPTION
Raman and infrared spectroscopy of molecules adsorbed on metal electrodes [AD-A143466] N84-32454

MOLECULAR BEAMS
Molecular beam mass spectrometer sampling of flash ignited combustion [DE84-006771] N84-32459
Physical properties of CdTe films grown by hotwall and molecular beam techniques [AD-A143180] N84-33214
Chemical reaction dynamics at surfaces N84-33340

MOLECULAR CLOUDS
Radio astronomy N84-33349

MOLECULAR COLLISIONS
Formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules [AD-A143552] N84-33226

MOLECULAR GASES
Dynamics of large molecules and molecular clusters [AD-A143386] N84-32542
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km [NASA-CR-173879] N84-32951

MOLECULAR INTERACTIONS
Semiconductor surface studies N84-33338

MOLECULAR RELAXATION
Electrical and differential scanning calorimetry studies of poly(ethylene oxide) complexed with alkaline earth thiocyanates [AD-A143198] N84-32449
Chemical reactions, radiative and energy transfer processes of important atmospheric species [AD-A143264] N84-33156
Anomalous pressure dependence of dipolar relaxation times in rare earth doped lead fluoride [AD-A143201] N84-33215

MOLECULAR SPECTROSCOPY
Dynamics of large molecules and molecular clusters [AD-A143386] N84-32542

MOLECULAR STRUCTURE
Studies of structural properties and their relationship to critical parameters in superconducting materials [AD-A143556] N84-33227

MOLECULAR WEIGHT
Structural pressure sensitive silicone adhesives [NASA-CASE-LAR-13270-1] N84-32532

MOLECULES
Dynamics of large molecules and molecular clusters [AD-A143386] N84-32542

MOLTEN SALTS
Characterization of voltage losses during high-intensity current pulses in reactive, porous electrodes of molten salt cells [DE84-012112] N84-32730
Molten carbonate fuel cell performance model update [DE84-012932] N84-32733
Electrochemical performance of porous nickel sulfide electrodes [DE84-009586] N84-32741
Technology Base Research Project for Electrochemical Energy Storage [DE84-013877] N84-32930

MOLTING
Features of behaviour of gas bubbles in molten oxide films during enamelling [BLL-M-35672-(5828.4)] N84-32496

MOLYBDENUM CARBIDES
Procedure for the electroplating of sintered materials containing carbide or cast alloys of tungsten, molybdenum, titanium or zirconium [BLL-I 3LEY-TRANS-4557-(9091.9)] N84-32484

MOMENTS
Canonic measurements in the classic moment problem N84-33041

MOMENTS OF INERTIA
Structural performance of orthogonal tetrahedral truss Space-Station configurations [NASA-TM-86260] N84-32422

MOMENTUM TRANSFER
Free charged particle behavior in intense laser fields [DE84-013700] N84-33160
Dynamics of heat, mass and momentum transfer in an inductively coupled plasma [DE84-013499] N84-33200

MONITORS
Computer-based transmission monitor and control system [PB84-202068] N84-33069
Conceptual design of a monitoring system for the Charters of Freedom [NASA-CR-173909] N84-33285

MONOTONE FUNCTIONS
Canonic measurements in the classic moment problem N84-33041

MONTE CARLO METHOD
MECA: A supercomputer for Monte Carlo [DE84-014129] N84-33066

MOON
Morphologic studies of the Moon and planets [NASA-CR-173886] N84-33319
A geographic comparison of selected large-scale planetary surface features [NASA-TM-86147] N84-33320

MORPHOLOGY
Aggradation and degradation at alluvial-channel beds [PB84-201557] N84-32905
The octahedron-rhombododecahedron morphological series of synthetic diamond crystals [CSIR-TRANS-1746] N84-33205

MORTALITY
Correlation between plasma fibronectin level and mortality following experimental rat heat stress [AD-A143383] N84-32991

MOSSBAUER EFFECT
Studies of structural properties and their relationship to critical parameters in superconducting materials [AD-A143556] N84-33227

MOTION
A study of methods to predict and measure the transmission of sound through the walls of light aircraft. A survey of techniques for visualization of noise fields [NASA-CR-173917] N84-33146

MOTION PERCEPTION
Visual information transfer. 1: Assessment of specific information needs. 2: The effects of degraded motion feedback. 3: Parameters of appropriate instrument scanning behavior [NASA-CR-173913] N84-33020

MTBF
Availability of the DSN telemetry data system and its major elements, including the TWM assemblies N84-32639
A study of DSN traveling wave maser system reliability N84-32640

MULTIPLE ACCESS
Random multiple access methods in multi-user communication systems N84-32616

MULTIPLIERS
An extension of deLeeuw's theorem to the N-dimensional rotation group N84-33046
Completely continuous multipliers from L sub 1 (G) into L sub infinity (G) N84-33047

MULTIPROCESSING (COMPUTERS)
S-1 software development and maintenance [DE84-013071] N84-33091

MULTISPECTRAL BAND SCANNERS
A simulation of remote sensor systems and data processing algorithms for spectral feature classification [NASA-CR-172393] N84-32784

MULTIVARIATE STATISTICAL ANALYSIS
Climate prediction. Part 1: Cyclone frequency [AD-A143576] N84-32973
Distributions of central quadratic forms in normal variables: A comparison of algorithms [AD-A143468] N84-33116
Relationships among classes of spherical matrix distributions [AD-A143215] N84-33128

N

N-TYPE SEMICONDUCTORS
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246
NASA PROGRAMS
System analysis for the Huntsville Operational Support Center distributed computer system
[NASA-CR-171136] N84-33097
NASA Patents Abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 25)
[NASA-SP-7039(25)-SECT-2] N84-33257
NASA Administrative Data Base Management Systems, 1984
[NASA-CP-2323] N84-33266
The 1985 NASA authorization, volume 2
[GPO-34-202] N84-33301
National Aeronautics and Space Administration Authorization Act, 1985
[PUB-LAW-98-361] N84-33303
Aeronautics and space report of the President, 1983 activities
[NASA-TM-85536] N84-33364
NASTRAN
Twelfth NASTRAN Users' Colloquium
[NASA-CP-2328] N84-32864
COSMIC/NASTRAN free-field input N84-32865
The design and usage of the new data management features in NASTRAN N84-32866
Accuracy of three dimensional solid finite elements N84-32867
COSMIC/NASTRAN on the Cray computer systems N84-32868
Computer aided modeling and post processing with NASTRAN analysis N84-32869
Design spectrum analysis in NASTRAN N84-32870
Seismic analysis capability in NASTRAN N84-32871
Transient response dynamic module modifications to include static and kinetic friction effects N84-32872
Structural analysis of the support system for a large compressor driven by a synchronous electric motor N84-32873
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32875
Four new capabilities in NASTRAN for dynamic and aeroelastic analyses of rotating cyclic structures N84-32876
NAVIER-STOKES EQUATION
Fast solutions to the steady state compressible and incompressible fluid dynamic equations
[NASA-CR-172416] N84-32349
A finite element implementation of the dual variable method for the Navier-Stokes equations N84-32746
On the finite element approximation of the stream function-vorticity equations
[AD-A143508] N84-32758
Computational fluid dynamics at the ICMA (Institute of Computational Mathematics and Applications)
[AD-A143510] N84-32759
NAVIGATION AIDS
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372
Temperature controlled gyro
[AD-D011138] N84-32777
NAVIGATION SATELLITES
Direct measurement of Earth's vertical deflection using global positioning system
[AD-D011099] N84-32373
NAVY
Artificial Intelligence-Robotics applications to Navy aircraft maintenance
[AD-A143219] N84-32345
NEAR FIELDS
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket
[AD-A143266] N84-32653
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83765] N84-32789
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies
[AD-A143507] N84-32992
NEGATIVE IONS
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192
NETWORK SYNTHESIS
Relations between algorithms of adaptive optimization of antenna arrays and algorithms of optimum detection of multidimensional stochastic signal N84-32588
NEURONS
Mechanisms of thermoregulation of rats exposed to hypergravic fields N84-32989
NEUROPHYSIOLOGY
Physiology N84-33363
NEUTRINOS
Axions, neutrinos and strings: The formation of structure in an SO(10) universe
[NASA-TM-86139] N84-33317
NICKEL
Response of Inconel 617 superalloy to combined ground-based and STS reentry exposure
[NASA-TM-86293] N84-32505
NICKEL ALLOYS
Fundamental alloy studies
[DE84-013941] N84-32513
Role of grain size on the brittle to ductile transition of the strongly ordered alloy Ni3Al
[DE84-014904] N84-32519
NICKEL CADMIUM BATTERIES
Characterization of physiochemical properties of polymeric and electrochemical materials for aerospace flight
[NASA-CR-175258] N84-32534
NICKEL COATINGS
Solid-phase reaction of dispersed graphitized material with aluminium and nickel
[BLL-M-35633-(5828.4)] N84-32482
NICKEL COMPOUNDS
Electrochemical performance of porous nickel sulfide electrodes
[DE84-009586] N84-32741
NICKEL STEELS
Effect of precipitated austenite on the fracture of a ferritic cryogenic steel
[DE84-014604] N84-32521
NIMBUS 5 SATELLITE
Aspects of the Brazil current system according to SMS-2, NOAA-6, and Tiros-N satellites for 1979 to 1980
[INPE-2975-RPE/450] N84-32982
NIOBIUM
Composition and structure of multicomponent vanadium- and niobium-base coatings
[BLL-M-35657-(5828.4)] N84-32474
NITRIC ACID
Engine wear with methanol fuel in a nitrogen-free environment
[AD-A143530] N84-32833
NITROGEN
Gas chromatographic analysis of nitrogen
[BLL-RISLEY-TRANS-4563-(9091.9)] N84-32443
NITROGEN DIOXIDE
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010
Chemical reactions, radiative and energy transfer processes of important atmospheric species
[AD-A143264] N84-33156
NOAA SATELLITES
Satellite activities of NOAA, 1983 N84-32408
NOAA 6 SATELLITE
Aspects of the Brazil current system according to SMS-2, NOAA-6, and Tiros-N satellites for 1979 to 1980
[INPE-2975-RPE/450] N84-32982
NOISE (SOUND)
Studies in a transonic rotor aerodynamics and noise facility
[NASA-CR-166586] N84-32399
An improved method for the prediction of centrifugal compressor rotational-tone noise
[DE84-013345] N84-32842
NOISE MEASUREMENT
A study of methods to predict and measure the transmission of sound through the walls of light aircraft. A survey of techniques for visualization of noise fields
[NASA-CR-173917] N84-33146
NOISE PREDICTION
A study of methods to predict and measure the transmission of sound through the walls of light aircraft. A survey of techniques for visualization of noise fields
[NASA-CR-173917] N84-33146
Application of stiffened cylinder analysis to ATP interior noise studies
[NASA-CR-172364] N84-33147
NOISE REDUCTION
Video noise reduction
[BBC-RD-1984/7] N84-32615
Application of stiffened cylinder analysis to ATP interior noise studies
[NASA-CR-172364] N84-33147
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 1: Test nozzles and acoustic data
[NASA-CR-168234-VOL-1] N84-33148
NOISE SPECTRA
Random signal recognition based on spectral moments N84-32597
NONDESTRUCTIVE TESTS
Development of shearography for nondestructive testing of highway structure
[PB84-187244] N84-32577
Time-to-corrosion of reinforcing steel in concrete slabs. Volume 5: Calcium nitrite admixture or epoxy-coated reinforcing bars as corrosion protection systems
[PB84-195239] N84-32578
Forecasting of high voltage insulation performance: Testing of recommended potting materials and of capacitors
[NASA-TM-85536] N84-32681
Robotisation of dye penetrant inspection: A study of a prototype and its development
[BLL-RISLEY-TRANS-4585-(9091.9)] N84-32847
Eddy current testing of steam generator tubes
[BLL-RISLEY-TRANS-4584-(9091.9)] N84-32848
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32850
Application of elastic wave scattering theory to the detection and characterization of flaws in structural materials
[DE84-013729] N84-32852
Non-destructive testing of semiconductors using surface acoustic wave
[AD-A143559] N84-33228
NONFERROUS METALS
Distribution of micro-heterogeneous deformation in O8Yu steel around inclusions during compression
[BLL-M-35641-(5828.4)] N84-32498
NONLINEAR EQUATIONS
Singularities connected with a trace on a Banach algebra N84-33034
The well-posedness of the Kuramoto-Sivashinsky equation
[NASA-CR-172431] N84-33053
NONLINEAR OPTICS
Investigation of optical fibers for nonlinear optics
[AD-A143565] N84-33185
NONLINEAR SYSTEMS
Thermally induced instabilities of two-layer fluid systems N84-32745
Nonlinear elastic stability analysis of plane frames N84-32853
Simple examples of non linear truss behavior
[AD-A143368] N84-32882
Static methods in the design of nonlinear automatic control systems
[AD-A143297] N84-33101
Symbolic dynamics and nonlinear semiflows
[AD-A143487] N84-33117
NONLINEARITY
Utilization of nonlinear properties of IMPATT-diodes in microwave devices (survey) N84-32603
Video noise reduction
[BBC-RD-1984/7] N84-32615
Simulation of the Kelvin-Helmholtz instability of a supersonic slip surface with the Piecewise-Parabolic Method (PPM)
[DE84-013219] N84-32768
Behavior of orbits of two coupled oscillators
[DE84-013379] N84-33197
Infrared nonlinear optics N84-33348
NONPOINT SOURCES
Locating and estimating air emissions from sources of chloroform
[PB84-200617] N84-32935
NORMALITY
Robust C(Alpha)-type tests for linear models
[AD-A143177] N84-33125
Investigation of an empirical probability measure based test for multivariate normality
[DE84-012626] N84-33135
NOSE CONES
Aerodynamic heating computations for projectiles. Volume 1: In-depth heat conduction modifications to the ABRES shape change code (BRLASCC)
[AD-A143252] N84-32359
NOVA LASER SYSTEM
Strategies of design, development and activation of the Nova control system
[DE84-013075] N84-32601

Dynamic testing of NOVA laser structural systems. The north side of Spaceframe Tower
[DE84-014830] N84-32816

NOZZLE GEOMETRY
Fuselage and nozzle pressure distributions of a 1/12-scale F-15 propulsion model at transonic speeds. Effect of fuselage modifications and nozzle variables
[NASA-TP-2333] N84-32354
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 1: Test nozzles and acoustic data
[NASA-CR-168234-VOL-1] N84-33148

NUCLEAR ELECTRIC PROPULSION
Space reactors: What is a kilogram?
[DE84-012656] N84-33169

NUCLEAR MAGNETIC RESONANCE
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers
[AD-A143202] N84-32451
Carbon-13 and proton nuclear magnetic resonance analysis of shale-derived refinery products and jet fuels and of experimental referee broadened-specification jet fuels
[NASA-CR-174761] N84-32552

NUCLEAR POWER PLANTS
The development of methods to predict both the dynamic and the pseudo-static response of secondary structures subjected to seismic excitations
[DE84-010284] N84-32884
Aircraft, ships, spacecraft, nuclear plants and quality
[DE84-013262] N84-33166

NUCLEAR POWER REACTORS
Eddy current testing of steam generator tubes
[BLL-RISLEY-TRANS-4584-(9091.9)] N84-32848

NUCLEAR ROCKET ENGINES
Thermionic conversion reactor technology assessment
[DE84-007611] N84-33168

NUCLEATE BOILING
Dynamics of normal-zone propagation in Ta at small currents
[DE84-009990] N84-33245

NUCLEATION
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33248

NUCLEON-NUCLEON INTERACTIONS
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-dadron systems, hadron form factors, and Dirac particles
[DE84-012971] N84-33161

NUCLEON-NUCLEON SCATTERING
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-dadron systems, hadron form factors, and Dirac particles
[DE84-012971] N84-33161

NUCLIDES
Model for GCR-particle fluxes in stony meteorites and production rates of cosmogenic nuclides
[NASA-CR-173923] N84-33321

NUMBER THEORY
Infinitesimal L-classes of a group of algebraic numbers N84-33039

NUMERICAL ANALYSIS
Improvements in the accuracy and stability of algorithms for the small-disturbance and full-potential equations applied to transonic flows
[NASA-TM-85970] N84-32350
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-173916] N84-32645
Natural convection in porous media: An experimental and numerical study for vertical annular and rectangular enclosures N84-32744
Summary of research in applied mathematics, numerical analysis and computer science at the Institute for Computer Applications in Science and Engineering
[NASA-CR-172421] N84-33024

NUMERICAL CONTROL
Calibration and performance of a high-resolution gamma-spectroscopy system
[DE84-012792] N84-32462
Computer system for fiber creep testing
[DE84-014453] N84-32885
Investigation of Doubly-Fed Machine in Variable Speed Applications
[DE84-012943] N84-32928
Computer-based transmission monitor and control system
[PB84-202068] N84-33069
Conceptual design of a monitoring system for the Charters of Freedom
[NASA-CR-173909] N84-33285

NUMERICAL STABILITY
Stability analysis of finite difference schemes for hyperbolic systems, and problems in applied and computational linear algebra
[AD-A143537] N84-33119

NUMERICAL WEATHER FORECASTING
Use of the tensor product for numerical weather prediction by the finite element method, part 1
[AD-A143273] N84-32970

NYLON (TRADEMARK)
Textile ballistic performance (data base)
[AD-A143249] N84-32541

NYSTAGMUS
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33016

O

O RING SEALS
Hybrid seal
[AD-D011083] N84-32835

OCEAN CURRENTS
Global Observations and Understanding of the General Circulation of the Oceans
[NASA-CR-173905] N84-32986
High-frequency acoustic backscatter from the sea surface
[AD-A143536] N84-33152

OCEAN SURFACE
Determination of sea surface temperature with N-ROSS (Navy-Remote Ocean Sensing System)
[AD-A143563] N84-32984
High-frequency acoustic backscatter from the sea surface
[AD-A143536] N84-33152

OCEAN TEMPERATURE
Determination of sea surface temperature with N-ROSS (Navy-Remote Ocean Sensing System)
[AD-A143563] N84-32984

OCEANOGRAPHY
Aspects of the Brazil current system according to SMS-2, NOAA-6, and Tiros-N satellites for 1979 to 1980
[INPE-2975-RPE/450] N84-32982

OCEANS
The feasibility, practicality and utility of P-3 inflight refueling
[AD-A143419] N84-32382

OFFSHORE PLATFORMS
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32875

OIL RECOVERY
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912

OILS
Thermal analysis of a planetary transmission with spherical roller bearings operating after complete loss of oil
[NASA-TP-2367] N84-32824

OLIVINE
Mechanisms of electrical conductivity in olivine
[DE83-017313] N84-32723

ON-LINE SYSTEMS
NASA Administrative Data Base Management Systems, 1984
[NASA-CP-2323] N84-33266
Strategies for converting to a DBMS environment N84-33267
The administrative window into the integrated DBMS N84-33270
A user view of office automation or the integrated workstation N84-33271
NATURAL graphics N84-33274
Scientific and technical information transfer: Issues and options
[RAND/N-2131-NSF] N84-33286

ONBOARD DATA PROCESSING
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372

OPERATOR PERFORMANCE
Visual perception in systems management in aeronautics N84-33017

OPERATORS
Annals of the Fourier Institute, volume 34, no. 2
[ISSN-0373-0956] N84-33038

OPERATORS (MATHEMATICS)
Annals of the Fourier Institute, volume 34, no. 1
[ISSN-0373-0956] N84-33025
Singularities connected with a trace on a Banach algebra N84-33034
Fatou theorem for the proper functions of invariant potential operators by a group of Cartan displacements N84-33037
Uniqueness in the Cauchy problem for second order operators with real symbols N84-33045
Completely continuous multipliers from L sub 1 (G) into L sub infinity (G) N84-33047

OPTICAL COMMUNICATION
Peculiarities in construction of optical receivers for digital fiber-optic communication lines N84-32596
Synchronization tracking in pulse position modulation receiver
[NASA-CASE-NPO-16256-1] N84-32620
Optics and quantum electronics N84-33343
Optical propagation and communication N84-33355

OPTICAL DENSITY
Turbulent diffusion, dissipation, and winds from calibrated photographs of artificial clouds
[AD-A143231] N84-32956

OPTICAL EMISSION SPECTROSCOPY
Infrared nonlinear optics N84-33346

OPTICAL EQUIPMENT
Containerless high purity pulling process and apparatus for glass fibers
[NASA-CASE-MFS-25905-2] N84-32569
Peculiarities in construction of optical receivers for digital fiber-optic communication lines N84-32596
Graphical error analysis
[BMFT-FB-T-84-061] N84-33093
Optical power source control system
[AD-D011124] N84-33175
Optical distortion analyzer system
[AD-D011127] N84-33176

OPTICAL FILTERS
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172
Varying bandpass of optical spatial filter by rotating mirrors having changing reflectivity
[AD-D011114] N84-33173
Phase-only optical filter for use in an optical correlation system
[AD-D011093] N84-33187

OPTICAL MEASURING INSTRUMENTS
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183

OPTICAL PROPERTIES
Method of measuring optical properties of a transparency
[AD-D011117] N84-33188

OPTICAL RADAR
Practical problems with CO2 laser radar tests
[RAE-TRANS-2113] N84-32804

OPTICAL RESONATORS
Quantum optics and photonics N84-33344

OPTICAL THICKNESS
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314

OPTICAL TRACKING
Target for optically activated seekers and trackers
[AD-D011059] N84-33171

OPTICAL WAVEGUIDES
Optics and quantum electronics N84-33343

OPTIMIZATION
Optimization of antenna structure design N84-32624
SEAMOPT: Sterling engine optimization code
[DE84-012098] N84-32840
Duality in inexact fractional programming with set-inclusive constraints
[DE84-023584] N84-33092

OPTOMETRY
Physiology N84-33363

ORBIT CALCULATION
Flight Experiment Demonstration System (FEDS): Mathematical specification
[NASA-CR-175252] N84-32405
Comparison of analytical theories for studying the contraction of artificial satellite orbits
[INPE-2746-PRE/322] N84-32409

ORBITAL ELEMENTS
Relative motion characteristics of 2 near-Earth Satellites
[NASA-CR-173687] N84-33316

ORBITAL MANEUVERING VEHICLES
Computer vision for real-time orbital operations. Center directors discretionary fund
[NASA-TM-86457] N84-33076

ORBITAL MECHANICS
Comparison of analytical theories for studying the contraction of artificial satellite orbits
[INPE-2746-PRE/322] N84-32409

ORBITAL RENDEZVOUS
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650

ORBITS
Symbolic dynamics and nonlinear semiflows
[AD-A143487] N84-33117

Behavior of orbits of two coupled oscillators
[DE84-013379] N84-33197
ORGANIC COMPOUNDS
Optical and electrical properties of organic dye crystals
[DE84-014690] N84-33240
ORGANIC PHOSPHORUS COMPOUNDS
Synthesis and characterization of phosphorus-containing polyamides and copolyamides based on 1methyl}-2,4- and -2,6-diaminobenzenes
[NASA-TM-86577] N84-32431
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005
ORGANIZATIONS
Source hierarchy list. Volume 1: A through H
[AD-A143500] N84-33291
Source hierarchy list. Volume 2: I through Z
[AD-A143501] N84-33292
ORTHOGONALITY
The least squares lattice algorithm: An alternate derivation with a discussion of numerical conditioning
[AD-A143439] N84-33114
OSCILLATIONS
Experimental investigation of certain beam transport issues in a pulsed transmission line linear accelerator
[DE84-011191] N84-33164
Onset of oscillations in symmetric convective states in a superfluid He-3-He-4 mixture
[DE84-009984] N84-33244
OSCILLATORS
Inductive transducer for displacement-to-frequency conversion N84-32594
Stable asynchronous two-frequency oscillations in Gunn-effect diode with open resonator structure N84-32611
Pulse driver for flux gate magnetometer
[AD-D011063] N84-32774
Variable gain oven temperature control circuit
[AD-D011141] N84-32778
Behavior of orbits of two coupled oscillators
[DE84-013379] N84-33197
OTS (ESA)
A transportable satellite Earth station
[BBC-RD-1984/8] N84-32614
OUTPUT
Interrelation between parameters of M-type traveling wave tube N84-32598
Verification of hourly forecasts of wind turbine power output
[PNL-4900] N84-32914
OXIDATION
A comprehensive chemical kinetic reaction mechanism for the oxidation of n-butane
[DE84-005739] N84-32467
Effect of alloy chemistry and exposure conditions on the oxidation of titanium
[NASA-TM-86295] N84-32507
Physical techniques for profiling heterogeneous polymer degradation
[DE84-013607] N84-32547
Electronically conductive ceramics for high temperature oxidizing environments
[DE84-014506] N84-32549
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts N84-32998
OXIDATION-REDUCTION REACTIONS
Review of flow battery testing at Sandia
[DE84-011186] N84-32734
OXIDE FILMS
Features of behaviour of gas bubbles in molten oxide films during enamelling
[BLL-M-35672-(5828.4)] N84-32496
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
OXYGEN
A system for controlling the oxygen content of a gas produced by combustion
[NASA-CASE-LAR-13257-1] N84-32447
Oxygen affinity of hemoglobin, 3 hours after passive increase in altitude from 400 to 1800 metres
[RAE-TRANS-2116] N84-33004
OXYGEN CONSUMPTION
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005
OZONE
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010

P

P-N JUNCTIONS
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
P-TYPE SEMICONDUCTORS
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246
P-3 AIRCRAFT
The feasibility, practicality and utility of P-3 inflight refueling
[AD-A143419] N84-32382
Passive line-of-sight stabilization for an infrared sensor
[AD-A143305] N84-32792
PACIFIC OCEAN
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892
Paleomagnetism, rock magnetism and diagenesis in hemipelagic sediments from the northeast Pacific Ocean and the Gulf of California N84-32944
PACKETS (COMMUNICATION)
GCF compatibility with packets and data compression N84-32641
PAIR PRODUCTION
Influence of choice of pair-interaction potential on results of modelling an edge dislocation in Alpha-iron
[BLL-M-35682-(5828.4)] N84-32499
PALEOMAGNETISM
Paleomagnetism, rock magnetism and diagenesis in hemipelagic sediments from the northeast Pacific Ocean and the Gulf of California N84-32944
PALLADIUM ALLOYS
Thermomagnetic properties of GdPd
[DE84-009991] N84-32515
PANELS
Potential surface improvements by bump removal for 64-m antenna N84-32627
PARABOLIC ANTENNAS
The correction of aberrations computed in the aperture plane of multifrequency microwave radiometer antennas
[NASA-TM-86090] N84-32679
PARABOLIC REFLECTORS
A nomographic methodology for use in performance trade-off studies of parabolic dish solar power modules
[NASA-CR-173908] N84-32918
PARALLEL PROCESSING (COMPUTERS)
An automatic syntheses of hardware algorithm N84-32568
Adaptive analog-to-digital converter N84-32591
The design and performance of a parallel computer architecture for simulation N84-33054
On the impact of communication complexity in the design of parallel numerical algorithms
[NASA-CR-172436] N84-33059
The effect of queueing disciplines on response times in distributed systems
[DE84-012639] N84-33086
Theoretical issues in the design and verification of distributed systems N84-33096
PARALLEL PROGRAMMING
The use of pipeline techniques in the architecture of digital processors employed in real time applications
[INPE-2992-TDL/153] N84-33075
PARAMETER IDENTIFICATION
Correlational estimation of parameters of solid state microwave devices N84-32609
Mapping magnetized geologic structures from space: The effect of orbital and body parameters
[E84-10191] N84-32895
Summary of research in applied mathematics, numerical analysis and computer science at the Institute for Computer Applications in Science and Engineering
[NASA-CR-172421] N84-33024
Parameter estimation for the Euler-Bernoulli-beam
[NASA-CR-172417] N84-33107
New techniques for adjusting reference factors
[DE84-012649] N84-33300
PARAMETERIZATION
New techniques for adjusting reference factors
[DE84-012649] N84-33300
PARTIAL DIFFERENTIAL EQUATIONS
Normal modes of the NCAR (National Center for Atmospheric Research) Community Forecast Model (CFM)
[PB84-191220] N84-33094
PARTIAL PRESSURE
Technique for measuring gas conversion factors
[NASA-CASE-LAR-13220-1] N84-32786
PARTICLE ACCELERATORS
Adone parameters, beam structure and luminosity — particle acceleration
[DE84-012866] N84-33154
Future of high energy physics
[DE84-013513] N84-33165
PARTICLE BEAMS
Adone parameters, beam structure and luminosity — particle acceleration
[DE84-012866] N84-33154
Autogenerator of beams of charged particles
[DE84-014242] N84-33163
PARTICLE DENSITY (CONCENTRATION)
Effects of system and geometrical parameters on the flow of Class-B solids in overflow standpipes
[DE84-013948] N84-32762
Observation of advanced particle removal rates in pump limiter simulation experiments
[DE84-014327] N84-33202
PARTICLE DIFFUSION
Trapped particle absorption by the Ring of Jupiter
[NASA-CR-173919] N84-33323
PARTICLE INTERACTIONS
Frequency conversion in photomultiplier during interaction of photoelectron beam and electric field in heterodyne N84-32599
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957
PARTICLE MASS
Adone parameters, beam structure and luminosity — particle acceleration
[DE84-012866] N84-33154
PARTICLE MOTION
Dynamics of large molecules and molecular clusters
[AD-A143386] N84-32542
The prediction of acoustical particle motion using an efficient polynomial curve fit procedure
[NASA-CR-173915] N84-33145
Adone parameters, beam structure and luminosity — particle acceleration
[DE84-012866] N84-33154
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160
Modified Thomson parabola ion spectrometers for use in laser generated plasma experiments
[AD-A143298] N84-33190
Behavior of orbits of two coupled oscillators
[DE84-013379] N84-33197
PARTICLE SIZE DISTRIBUTION
Method for the particle size independent spectrometric determination of metal particles in lubricating oils and hydraulic fluids
[AD-D011121] N84-32445
Special features of the formation of a bed of polydispersed free-flowing materials
[BLL-M-35674-(5828.4)] N84-32747
Aerosol measurements at an optical propagation site on the Outer Hebrides
[AD-A143564] N84-32972
PARTICLE TRACKS
Modified Thomson parabola ion spectrometers for use in laser generated plasma experiments
[AD-A143298] N84-33190
PARTICLE TRAJECTORIES
Numerical techniques for the prediction of flow induced orientation N84-32743
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957
PARTICULATE SAMPLING
High-efficiency particulate air filter behavior at high-speed flows
[DE84-014137] N84-32769
PASTE (CONSISTENCY)
Pastes of superhard materials (review of inventions)
[CSIR-TRANS-1741] N84-32491
PATENT APPLICATIONS
NASA Patents Abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 25)
[NASA-SP-7039(25)-SECT-2] N84-33257
PATENTS
Pastes of superhard materials (review of inventions)
[CSIR-TRANS-1741] N84-32491
Coatings on diamond and CBN abrasives (review of inventions)
[CSIR-TRANS-1742] N84-32525
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents. Appendix
[PB84-196997] N84-33255

Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents
[PB84-197003] N84-33256
NASA Patents Abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 25)
[NASA-SP-7039(25)-SECT-2] N84-33257

PATHOGENS
Rapid microbial identification by circular intensity differential scattering
[DE84-013894] N84-32993

PATHOLOGICAL EFFECTS
Handling of hydrazine in the Royal Danish Air Force N84-33014

PATTERN METHOD (FORECASTING)
Rand's experience in applying artificial intelligence techniques to strategic-level military-political war gaming
[P-6977] N84-33137
Scenario planning: Energy considerations in the long range urban transportation planning process
[DE84-013590] N84-33308

PATTERN RECOGNITION
An automatic syntheses of hardware algorithm N84-32568
Image identification by method of integral fluctuations N84-32601
Computer vision for real-time orbital operations. Center directors discretionary fund
[NASA-TM-86457] N84-33076

PAYLOAD TRANSFER
Space reactors: What is a kilogram?
[DE84-012656] N84-33169

PAYLOADS
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door
[NASA-CR-171732] N84-32416
The development of a high-capacity instrument module heat transport system, appendixes
[NASA-CR-175260] N84-32750

PERCEPTION
Determination of factors affecting performance and productivity in an engineering/design environment
[AD-A143315] N84-33252

PERFORMANCE PREDICTION
Ferrous alloy metallurgy, liquid lithium corrosion and welding
[DE84-014656] N84-32517
A simulation of remote sensor systems and data processing algorithms for spectral feature classification
[NASA-CR-172393] N84-32784
Automotive Stirling Engine Development Program. RESD summary report
[NASA-CR-174674] N84-33307

PERFORMANCE TESTS
Producing thermomagnetic alloy by powder metallurgy
[BLL-M-35668-(5828.4)] N84-32500
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 4: Functional specification for the prototype Automated Integrated Receive System (AIRS)
[NASA-CR-175264] N84-32649
Hot-spot heating in central-station arrays N84-32686
Qualification tests and electrical measurements: Practice and problems N84-32703
Qualification and testing of modules N84-32704
Qualification testing and electrical measurement experience: A manufacturer's view N84-32705
Qualification testing for a central station N84-32706
DC (Direct-Current) partial-discharge-environmental screening of space TWTs (Traveling Wave Tubes)
[AD-A143230] N84-32710
Develop real-time dosimetry concepts and instrumentation for long-term missions
[NASA-CR-171809] N84-32791
Design of a high-performance slide and drive system for a small precision machining research lathe
[DE84-011059] N84-32845

PERIODIC VARIATIONS
Mass transfer from a circular cylinder: Effects of flow unsteadiness and slight nonuniformities
[NASA-CR-174759] N84-32751

PERIODICALS
European scientific notes, Volume 38, Number 7
[AD-A143236] N84-33267

PERISCOPES
Around-a-mast quadrifilar microstrip antenna
[AD-D011051] N84-32617

PERMEABILITY
Molecule microscopy N84-33337

PERMITTIVITY
Dielectric breakdown distributions of large dielectric constant liquids
[DE84-013216] N84-32461

PEROVSKITES
Studies of structural properties and their relationship to critical parameters in superconducting materials
[AD-A143556] N84-33227

PERSONAL COMPUTERS
A user view of office automation or the integrated workstation N84-33271

PERSONNEL
Photodigitizing procedures
[AD-A143589] N84-32793
Determination of factors affecting performance and productivity in an engineering/design environment
[AD-A143315] N84-33252

PERSONNEL DEVELOPMENT
ADA (trademark) training curriculum. Basic ADA programming t202 teacher's guide, volume 1
[AD-A143584] N84-33083

PERSONNEL MANAGEMENT
Matrix management in DoD: An annotated bibliography
[AD-A143316] N84-33253

PERTURBATION
Improvements in the accuracy and stability of algorithms for the small-disturbance and full-potential equations applied to transonic flows
[NASA-TM-85970] N84-32350

PERTURBATION THEORY
Persistence of the Hopf bifurcation under singular perturbations
[DE84-013871] N84-33120

PETROGRAPHY
Petrography and ultrasonic wave velocity in the Admire Formation (Permian), Kansas N84-32945

PETROLOGY
The petrology, structure and geochemistry of an Archean terrane in the North Snowy Block, Beartooth Mountains, Montana N84-32940

PHASE LOCKED SYSTEMS
Simultaneous detection of time coincident signals in an adaptive Doppler tracker
[AD-D011092] N84-32659
Manipulation of the mixing process between streams of different velocity and temperature in the presence of pressure gradient
[AD-A143467] N84-32757

PHASE SHIFT
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-hadron systems, hadron form factors, and Dirac particles
[DE84-012971] N84-33161
Phase-only optical filter for use in an optical correlation system
[AD-D011093] N84-33187

PHASE SHIFT CIRCUITS
Optimum synthesis of stepped second class phase-shifters N84-32587
Monolithic integrated antenna systems
[AD-A143184] N84-32708

PHASE SHIFT KEYING
Phase shift keying apparatus
[AD-D011119] N84-32660

PHASE TRANSFORMATIONS
Topochemical reactions and the Stefan problem
[BLL-M-35671-(5828.4)] N84-32501
Diamond synthesis from various graphites
[CSIR-TRANS-1749] N84-32528
Superfluid helium 2 liquid-vapor phase separation: Technology assessment
[NASA-TM-85966] N84-32752
X-ray diffuse scattering N84-33341
Phase transitions in chemisorbed systems N84-33342

PHENOLS
Protected ethynylated phenols
[AD-D011096] N84-32544

PHONEMICS
Linguistics N84-33359

PHOSPHINES
Perfluoroalkylether substituted phenyl phosphines
[AD-D011122] N84-32529
Mechanisms involved in the glow-discharge deposition of doped hydrogenated amorphous silicon
[DE84-013124] N84-33236

PHOTOCHEMICAL REACTIONS
Review of solar fuel-producing quantum conversion processes
[NASA-CR-173904] N84-32916
Solar photochemical process engineering for production of fuels and chemicals
[NASA-CR-173910] N84-32917
Proceedings of the Solar Thermal-Photochemical Conversion Workshop
[DE84-000089] N84-32929

PHOTOCONDUCTORS
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors
[INPE-3045-TDL/157] N84-33212

PHOTOELECTRIC CELLS
Proceedings of the Solar Thermal-Photochemical Conversion Workshop
[DE84-000089] N84-32929

PHOTOGRAPHIC FILM
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178
Method of measuring optical properties of a transparency
[AD-D011117] N84-33188

PHOTOGRAPHIC MEASUREMENT
Turbulent diffusion, dissipation, and winds from calibrated photographs of artificial clouds
[AD-A143231] N84-32956

PHOTOINTERPRETATION
Turbulent diffusion, dissipation, and winds from calibrated photographs of artificial clouds
[AD-A143231] N84-32956

PHOTOIONIZATION
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314

PHOTOLUMINESCENCE
Electronic properties of amorphous silicon dioxide N84-33351

PHOTOMULTIPLIER TUBES
Frequency conversion in photomultiplier during interaction of photoelectron beam and electric field in heterodyne N84-32599

PHOTONICS
Quantum optics and photonics N84-33344

PHOTONS
Preliminary design of a 10-kW thermophotovoltaic system for space applications
[NASA-TM-83768] N84-32427
A study of the temporal and spectral characteristics of gamma ray bursts N84-33331

PHOTOSYNTHESIS
Unraveling photosystems
[DE84-013812] N84-32994

PHOTOVOLTAIC CELLS
The NASA photovoltaic technology program
[NASA-TM-83665] N84-32426
Preliminary design of a 10-kW thermophotovoltaic system for space applications
[NASA-TM-83768] N84-32427
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations
[NASA-CR-173918] N84-32683
Source-circuit design with multiple photovoltaic manufacturers N84-32685
Hot-spot heating in central-station arrays N84-32686
A review and summary of cell and module mismatch losses from theoretical and experimental studies N84-32689
Electrical insulation design requirements and reliability goals N84-32691
Laboratory experience with voltage breakdown N84-32693
Breakdown of organic insulators N84-32694
Photovoltaic system grounding and fault protection N84-32696
Grounding and fault protection of the SMUD PVI array N84-32698
Photovoltaic central station step and touch potential considerations in grounding system design N84-32699
Interface standardization N84-32700
Evolution of integrated panel structural design and interfaces for PV power plants N84-32701
Is structural interface standardization beneficial? N84-32702
Qualification and testing of modules N84-32704
Qualification testing and electrical measurement experience: A manufacturer's view N84-32705
Qualification testing for a central station N84-32706
Module utilization committee
[NASA-CR-173898] N84-32920
Influence of the interfacial layer on electrooptical properties of heterojunction solar cells
[DE84-013285] N84-32925
Thermal modeling of line focus photovoltaic systems
[DE84-013920] N84-32927
High-efficiency multi-colored photovoltaic cells
[PB84-200575] N84-32932

PHOTOVOLTAIC EFFECT
Preliminary design of a 10-kW thermophotovoltaic system for space applications
[NASA-TM-83768] N84-32427

Flate-plate photovoltaic power systems handbook for Federal agencies
[NASA-CR-173601] N84-32921
Stand-alone flat-plate photovoltaic power systems: System sizing and life-cycle costing methodology for Federal agencies
[NASA-CR-173603] N84-32922
Effects of expiration of the Federal energy tax credit on the National Photovoltaics Program
[NASA-CR-173600] N84-33200

PHYSICS
Physics in Europe: A data file of selected research
[AD-A143428] N84-33269

PHYSIOLOGICAL EFFECTS
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Hydrazine toxicology: Impact on safety and health in military aviation N84-33013
Handling of hydrazine in the Royal Danish Air Force N84-33014
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33016

PHYSIOLOGICAL TESTS
Visual field perimeter and psychomotor tracking performance measuring apparatus
[AD-D011056] N84-32775
Portable visual function tester
[AD-D011105] N84-32795

PHYSIOLOGY
Speech communication N84-33358

PIEZOELECTRIC TRANSDUCERS
Piezoelectric deicing device
[NASA-CASE-LEW-13773-2] N84-32782

PIEZOELECTRICITY
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 6
[NASA-CR-171126] N84-32780

PIEZORESISTIVE TRANSDUCERS
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171125] N84-32781

PILOT PERFORMANCE
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33016
Visual information transfer. 1: Assessment of specific information needs. 2: The effects of degraded motion feedback. 3: Parameters of appropriate instrument scanning behavior
[NASA-CR-173913] N84-33020

PILOTS (PERSONNEL)
Pilot jet lag experiments described N84-32997

PINS
Pin rocked blade biaxial air seal
[AD-D011066] N84-32391

PIONEER VENUS SPACECRAFT
Telecommunications and data acquisition support for the Pioneer Venus Project: Pioners 12 and 13, prelaunch through March 1984
[NASA-CR-173693] N84-32403

PIONEER 11 SPACE PROBE
Geometrical relationships of Pioneer 11 to Uranus and Voyager 2 in 1985-86
[NASA-CR-173675] N84-32406

PIONS
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-hadron systems, hadron form factors, and Dirac particles
[DE84-012971] N84-33161

PIPE FLOW
Developing turbulent flow in strongly curved passages of square and circular cross-section
[AD-A143279] N84-32755
Effects of system and geometrical parameters on the flow of Class-B solids in overflow standpipes
[DE84-013948] N84-32762

PIPELINES
Summary status of advanced water electrolysis and hydrogen storage/transport research and development
[DE84-012908] N84-32456
Eddy current testing of steam generator tubes
[BLL-RISLEY-TRANS-4584-(9091.9)] N84-32848

PIPELINING (COMPUTERS)
Programmable arithmetic logic unit
[AD-D011128] N84-33055
Array processor utilization in the computation of real-time images
[ARL-SYS-TM-73] N84-33056
The use of pipeline techniques in the architecture of digital processors employed in real time applications
[INPE-2992-TDL/153] N84-33075
Dynamic programming and transitive closure on linear pipelines
[AD-A143527] N84-33079

PIPES (TUBES)
Developing turbulent flow in a 180(0) curved pipe and its downstream tangent
[DE84-013391] N84-32787
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32875
Construction and evaluation of a flow test stand
[PB84-201581] N84-32906

PISTONS
Hybrid seal
[AD-D011083] N84-32835

PITCH (INCLINATION)
Calculation of the pressure distribution on a pitching airfoil with application to the Darrieus rotor
[DE84-013571] N84-32363

PLANAR STRUCTURES
Electroding of multi-layered epitaxial structures
[AD-D011137] N84-33209

PLANETARY BOUNDARY LAYER
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964

PLANETARY CRATERS
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

PLANETARY NEBULAE
The ionization structure of planetary nebulae V NGC 3242
[NASA-CR-173914] N84-33322

PLANETARY SURFACES
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

PLANTS (BOTANY)
Remote sensing for geobotanical prospecting N84-32889
Publications of the NASA space biology program for 1980 - 1984 — bibliographies
[NASA-TM-86857] N84-32990

PLASMA ACCELERATION
High-power RF compressor
[DE84-013116] N84-32664

PLASMA COMPOSITION
Heat transfer, fluid flow and element vaporization in laser welding
[DE84-011763] N84-32639

PLASMA CONDUCTIVITY
Propagation and absorption of electromagnetic waves in fully relativistic plasmas
[DE84-013627] N84-33204

PLASMA CONTROL
Physics issues in mirror and tandem mirror systems
[DE84-013837] N84-33201

PLASMA CURRENTS
Influence of magnetic shear on the collisional current driven ion cyclotron instability
[AD-A143391] N84-33191
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013861] N84-33196
Plasma dynamics N84-33354

PLASMA DENSITY
Observation of advanced particle removal rates in pump limiter simulation experiments
[DE84-014327] N84-33202

PLASMA DIAGNOSTICS
Dynamics of heat, mass and momentum transfer in an inductively coupled plasma
[DE84-013499] N84-33200

PLASMA DRIFT
Physics issues in mirror and tandem mirror systems
[DE84-013837] N84-33201

PLASMA ELECTRODES
Large aperture electro-optical switch
[DE84-013089] N84-32726

PLASMA EQUILIBRIUM
Accelerated convergence of the steepest-descent method for magnetohydrodynamic equilibria
[DE84-013602] N84-33195

PLASMA HEATING
Spot heating calculation for a heavy ion driven high temperature experiment
[DE84-013879] N84-33159
Plasma dynamics N84-33354

PLASMA INTERACTIONS
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192
Synergistic effects in plasma surface interactions
[DE84-012346] N84-33199

PLASMA JETS
Research and development of a plasma jet mass accelerator as a driver for impact fusion
[DE84-012940] N84-33196
Plasma-particle interaction effects in induction plasma modelling under dense loading conditions
[DE84-013388] N84-33203

PLASMA PHYSICS
RLE Progress Report no. 126
[RLE-PR-126] N84-33336

PLASMA SPECTRA
Relation of vertical intensity profiles for neutral atom lines to analyte atomization behavior in inductively coupled plasmas
[DE84-014126] N84-33194

PLASMA SPRAYING
Investigation of the state of materials in plasma deposition of refractory coatings
[BLL-M-35686-(5828.4)] N84-32485

PLASMA TEMPERATURE
Expressions to determine temperatures and emission measures for solar X-ray events from GOES measurements
[NASA-TM-86142] N84-33325

PLASMA TURBULENCE
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013861] N84-33196

PLASMA-PARTICLE INTERACTIONS
Plasma-particle interaction effects in induction plasma modelling under dense loading conditions
[DE84-013388] N84-33203

PLASMAS (PHYSICS)
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013861] N84-33196
Plasma dynamics N84-33354

PLASTIC DEFORMATION
Distribution of micro-heterogeneous deformation in O8Yu steel around inclusions during compression
[BLL-M-35641-(5828.4)] N84-32498

PLATES (STRUCTURAL MEMBERS)
Calculation of thermal stress state for components of metallurgical equipment by electric simulation
[BLL-M-35690-(5828.4)] N84-32860

POINT SPREAD FUNCTIONS
LANDSAT-4 image data quality analysis — LANDSAT 5 imagery
[E84-10173] N84-32893

POINTING CONTROL SYSTEMS
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control
[NASA-CR-173878] N84-33315

POLAR METEOROLOGY
Proceedings of a Workshop on Polar Stratospheric Clouds: Their Role in Atmospheric Processes
[NASA-CP-2318] N84-32952

POLARITY
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201508] N84-33329

POLARIZATION (WAVES)
Focusing twist reflector for electron-cyclotron resonance heating in the Tandem Mirror Experiment-upgrade
[DE84-012954] N84-32663

POLICIES
European scientific notes, Volume 38, Number 7
[AD-A143238] N84-33287
Notes for medical catalogers, 1983
[PB84-195874] N84-33296
National Aeronautics and Space Administration Authorization Act, 1985
[PUB-LAW-98-361] N84-33303

POLISHING
Optical fiber termination and splicing techniques
[DE84-013919] N84-32572

POLLUTION CONTROL
National environmental monitoring
[GPO-28-186] N84-32933

POLLUTION MONITORING
Compendium of selected methods for sampling and analysis at geothermal facilities
[PB84-199926] N84-32579
Passive sampling device for ambient air and personal monitoring
[PB84-210046] N84-32798
Locating and estimating air emissions from sources of carbon tetrachloride
[PB84-200625] N84-32936

POLYAMIDE RESINS
Textile ballistic performance (data base)
[AD-A143249] N84-32541

POLYCARBONATES
High energy physics research at Texas Agriculture and Mining University — magnetic monopoles in cosmic rays and hadron calorimeter design
[DE84-011616] N84-33167
POLYCRYSTALS
Development and testing of glass coatings for Hexanite-A powders
[CSIR-TRANS-1747] N84-32527
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173897] N84-33213
POLYETHYLENES
Effect of processing conditions on the reliability of crosslinked polyethlene cable insulation
[DE84-014902] N84-32546
POLYIMIDE RESINS
Development of partially fluorinated resin apex seals
[NASA-CR-174706] N84-32828
POLYIMIDES
A study of the effects of end-cap molecular species on environmental characteristics of polimidesulfones
[NASA-TM-86283] N84-32437
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535
POLYMER CHEMISTRY
Electrical and differential scanning calorimetry studies of poly(ethylene oxide) complexed with alkaline earth thiocyanates
[AD-A143198] N84-32449
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers
[AD-A143202] N84-32451
Electrically conducting poly(vinyl acetate)
[AD-A143199] N84-32538
Properties of UV-curable polyurethane acrylates: Effect of reactive diluent
[AD-A143241] N84-32540
Cure reactions, network structure and mechanical response of diaminodiphenyl sulfone cured tetraglycidyl 4,4'diaminodiphenyl methane
[DE84-012607] N84-32548
Development of partially fluorinated resin apex seals
[NASA-CR-174706] N84-32828
POLYMER PHYSICS
Physical techniques for profiling heterogeneous polymer degradation
[DE84-013807] N84-32547
POLYMERIZATION
The transformation of liquid to amorphous solid: The time to vitrify for styrene polymerization
[AD-A143228] N84-32452
Stabilized unsaturated polyesters
[NASA-CASE-NPO-16103-1] N84-32530
POLYPROPYLENE
Stabilized unsaturated polyesters
[NASA-CASE-NPO-16103-1] N84-32530
POLYURETHANE FOAM
Preliminary guidelines for maintenance of polyurethane foam (PUF) roofing systems
[AD-A143458] N84-32543
POLYURETHANE RESINS
Properties of UV-cured polyurethane acrylates: Effect of polyol type and molecular weight
[AD-A143176] N84-32537
Properties of UV-curable polyurethane acrylates: Effect of reactive diluent
[AD-A143241] N84-32540
POROSITY
Computer calculated analysis of subsurface formation porosities in central New York state N84-32941
POROUS MATERIALS
Molten carbonate fuel cell performance model update
[DE84-012932] N84-32733
Natural convection in porous media: An experimental and numerical study for vertical annular and rectangular enclosures N84-32744
The effects of porous material on microbubble skin friction reduction
[AD-A143401] N84-32756
POSITION (LOCATION)
Geometrical relationships of Pioneer 11 to Uranus and Voyager 2 in 1985-86
[NASA-CR-173675] N84-32406
Three precise gamma-ray burst source locations
[NASA-TM-86132] N84-33332
POSITION INDICATORS
Synchronization tracking in pulse position modulation receiver
[NASA-CASE-NPO-16256-1] N84-32620
POSITIONING DEVICES (MACHINERY)
Shaft positioning device
[AD-D011087] N84-32836
POTENTIAL FLOW
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
POTENTIAL THEORY
An application of fine potential theory to prove a Phragmen Lindelcef theorem N84-33043
POWDER METALLURGY
Sintered hard metal alloys and process for their manufacture
[CSIR-TRANS-1748] N84-32493
Producing thermomagnetic alloy by powder metallurgy
[BLL-M-35668-(5828.4)] N84-32500
Processing and consolidation of rapidly solidified alloys: A technology assessment
[DE84-014673] N84-32523
Processing science to increase the reliability of ceramics
[AD-A143207] N84-32539
POWER CONDITIONING
DC wiring system grounding and ground fault protection issues for central station photovoltaic power plants N84-32695
Investigation of Doubly-Fed Machine in Variable Speed Applications
[DE84-012943] N84-32928
I/O channel interface
[NBS-FIPS-PUB-60-2] N84-33057
POWER LINES
Current assessment of the potential of dielectric gas mixtures for industrial applications
[DE84-011656] N84-32724
POWER LOSS
A review and summary of cell and module mismatch losses from theoretical and experimental studies N84-32689
POWER MODULES (STS)
Hipot and continuity qualification est experience N84-32692
POWER REACTORS
Modeling of concrete response at high temperature
[DE84-009587] N84-32570
POWER SERIES
Analytical solution for computing first and second order ordinary differential equations using a method of series development
[INPE-2980-PRE/442] N84-33110
POWER SPECTRA
Random signal recognition based on spectral moments N84-32597
Period-doubling 2-torus state in a convecting He-3-superfluid He-4 solution
[DE84-009985] N84-33243
Studies of the microscale density fluctuations in the solar wind using interplanetary scintillations N84-33324
POWER SUPPLY CIRCUITS
Optical power source control system
[AD-D011124] N84-33175
PRECIPITATION (CHEMISTRY)
Epitaxial crystallization in the Te-HgTe-CdTe system
[CSIR-TRANS-1745] N84-33206
PRECIPITATION (METEOROLOGY)
Geomorphic approach to hydrograph synthesis, with potential for application to ungaged watersheds
[PB84-190115] N84-32904
Seasonal precipitation forecasting with a 6 to 7 month lead time in the Pacific Northwest using an information theoretic model
[PB84-207018] N84-32979
Southern oscillation-El Nino events: Characteristics, evolution, and precipitation anomalies
[INPE-2976-PRE/438] N84-32983
PREDICTION ANALYSIS TECHNIQUES
Heat-of-mixing experiments for liquefied gases
[PB84-215094] N84-32560
NASTRAN structural model for the large 64-meter antenna pedestal. Part 3: Applications to hydrostatic bearing oil film N84-32638
Microwave terrestrial link rain attenuation prediction parameter analysis
[PB84-207984] N84-32666
Numerical techniques for the prediction of flow induced orientation N84-32743
Accuracy of three dimensional solid finite elements N84-32867
The need for biaxial fatigue testing at A.R.L.
[AD-A143203] N84-32878
Failure prediction of notched pressure vessels using the CTOD approach
[DE84-013057] N84-32883
Climate prediction. Part 1: Cyclone frequency
[AD-A143576] N84-32973
Development of color criteria for advanced displays
[AD-A143246] N84-33006
Using statistical tools
[RAND/N-2121-PSSP] N84-33124
The prediction of acoustical particle motion using an efficient polynomial curve fit procedure
[NASA-CR-173915] N84-33145
PREDICTIONS
An improved method for the prediction of centrifugal compressor rotational-tone noise
[DE84-013345] N84-32842
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874
Predictions of satisfaction with automated library circulation systems N84-33259
PREMIXED FLAMES
Conditional velocity statistics in premixed CH-4-air and C-2H-4-air turbulent flames
[DE84-012257] N84-32484
PREPROCESSING
Cascaded adaptive loops
[AD-D011116] N84-32674
PRESIDENTIAL REPORTS
Goals and activities of the National Commission on Libraries and Information Science
[ISSN-0091-2972] N84-33282
A decade of accomplishment
[ISSN-0091-2972] N84-33283
Aeronautics and space report of the President, 1983 activities
[NASA-TM-85538] N84-33364
PRESSING (FORMING)
Certain assumptions of theory of hydrodynamic lubrication during metal pressure working
[BLL-M-35681-(5828.4)] N84-32822
PRESSURE DEPENDENCE
X-ray spectroscopy of solids under pressure
[DE84-013790] N84-33237
PRESSURE DISTRIBUTION
Fuselage and nozzle pressure distributions of a 1/12-scale F-15 propulsion model at transonic speeds. Effect of fuselage modifications and nozzle variables
[NASA-TP-2333] N84-32354
Calculation of the pressure distribution on a pitching airfoil with application to the Darrieus rotor
[DE84-013571] N84-32363
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
Laser beam duct pressure controller system
[AD-D011102] N84-32811
Opening of an interface flaw in a layered elastic half-plane under compressive loading
[NASA-TM-86282] N84-32877
Studies in climate
[PB84-196365] N84-32977
PRESSURE EFFECTS
Structural pressure sensitive silicone adhesives
[NASA-CASE-LAR-13270-1] N84-32532
PRESSURE GRADIENTS
Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine
[NASA-TP-2309] N84-32388
Manipulation of the mixing process between streams of different velocity and temperature in the presence of pressure gradient
[AD-A143467] N84-32757
PRESSURE MEASUREMENT
Subsonic and transonic unsteady- and steady-pressure measurements on a rectangular supercritical wing oscillated in pitch — wind tunnel tests
[NASA-TM-85765] N84-32348
Effects of system and geometrical parameters on the flow of Class-B solids in overflow standpipes
[DE84-013948] N84-32762
Technique for measuring gas conversion factors
[NASA-CASE-LAR-13220-1] N84-32786
Volumetric fuel quantity gauge
[NASA-CASE-LAR-13147-1] N84-32787
PRESSURE REGULATORS
Laser beam duct pressure controller system
[AD-D011102] N84-32811
PRESSURE SENSORS
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 6
[NASA-CR-171126] N84-32780
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171125] N84-32781
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171128] N84-32949
PRESSURE SWITCHES
Volumetric fuel quantity gauge
[NASA-CASE-LAR-13147-1] N84-32787
PRESSURE VESSELS
Failure prediction of notched pressure vessels using the CTOD approach
[DE84-013057] N84-32883

PRESSURE WELDING
The importance of impact pressure in the development of the process of formation of bonds between metals in the solid phase
[BLL-M-35858-(5828.4)] N84-32473
PRESSURIZED WATER REACTORS
Robotisation of dye penetrant inspection: A study of a prototype and its development
[BLL-RISLEY-TRANS-4585-(9091.9)] N84-32847
PRIMATES
A research study of the assessment of escape impairment by irritant combustion gases in postcrash aircraft fires
[FAA-CT-84-16] N84-32966
PRINTING
Cognitive information processing N84-33360
PROBABILITY DENSITY FUNCTIONS
An entropy maximum principle and instantaneous failure statistics
[AD-A143299] N84-32651
Sensor correlation and data fusion theory
[AD-A143567] N84-33133
PROBABILITY THEORY
Probabilistic models of the stress-rupture of composite materials: Summary
[DE84-013477] N84-32441
Threshold signals for detector having stabilization of false alarm probability N84-32560
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers
[AD-A143318] N84-32655
Using statistical tools
[RAND/N-2121-PSSP] N84-33124
Variability orderings related to coverage problems on the circle
[AD-A143364] N84-33130
Investigation of an empirical probability measure based test for multivariate normality
[DE84-012626] N84-33135
PROBES
Simulator-probe for diagnostic testing of short-wave radio channels N84-32595
PROBLEM SOLVING
Three-dimensional, time-dependent, compressible, turbulent, integral boundary layer equations in general curvilinear coordinates and their numerical solutions N84-32346
Optional stopping performance under graphic and numeric CRT formatting
[AD-A143274] N84-32712
Two phase system; Interfacial turbulence
[AD-A143162] N84-32754
Algorithmic integration of elementary transcendental functions on an algebraic curve N84-33052
Some practical Runge-Kutta formulas
[DE84-013539] N84-33123
Implicit function method for the Liouville equation
[DE84-013282] N84-33140
French firm uses unique flexible workshop with laser cutter N84-33143
PROCEDURES
A Gerdien condenser system for measuring stratospheric charged particle densities
[AD-A143317] N84-32958
Notes for medical catalogers, 1983
[PB84-195874] N84-33296
PROCESS CONTROL (INDUSTRY)
Effect of processing conditions on the reliability of crosslinked polyethlene cable insulation
[DE84-014902] N84-32546
PRODUCT DEVELOPMENT
Intelligent infrared sensor
[BMFT-FB-T-84-092] N84-33189
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173697] N84-33213
Spinoff, 1984
[NASA-TM-85586] N84-33305
PRODUCTION ENGINEERING
Ceramic component manufacturing technology development — silicon carbide tubing for industrial waste heat recovery
[PB84-215276] N84-32550
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173697] N84-33213
PRODUCTS
Forty years of development in diamond tools
[CSIR-TRANS-1730] N84-32564
PROGRAM VERIFICATION (COMPUTERS)
A theory of error-based testing
[AD-A143533] N84-33081
Programmer productivity aid catalog
[PB84-212166] N84-33095
PROGRAMMING LANGUAGES
Software conversion history of the Flight Dynamics System (FDS)
[NASA-CR-175257] N84-32404
Programming productivity enhancement by the use of application generators
[AD-A143532] N84-33080
ADA (trademark) training curriculum. Basic ADA programming t202 teacher's guide, volume 2
[AD-A143585] N84-33084
PROJECT MANAGEMENT
Satellite activities of NOAA, 1983 N84-32408
Module utilization committee
[NASA-CR-173898] N84-32920
National environmental monitoring
[GPO-28-188] N84-32933
Administrative automation in a scientific environment N84-33269
Oversight on the Federal Aviation Administration fiscal year 1985 research, engineering and development budget request
[GPO-34-924] N84-33302
National Aeronautics and Space Administration Authorization Act, 1985
[PUB-LAW-98-361] N84-33303
PROJECT PLANNING
Global Observations and Understanding of the General Circulation of the Oceans
[NASA-CR-173905] N84-32966
PROJECTILES
Aerodynamic heating computations for projectiles. Volume 1: In-depth heat conduction modifications to the ABRES shape change code (BRLASCC)
[AD-A143252] N84-32359
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC)
[AD-A143253] N84-32360
Aerodynamic heating computations for projectiles. Volume 3: BRL interactive plotting program (BRLINPLOT)
[AD-A143254] N84-32361
Research and development of a plasma jet mass accelerator as a driver for impact fusion
[DE84-012940] N84-33198
PROJECTIVE GEOMETRY
Infinitesmal deformation of locally symmetrical Riemann spaces. 2: Blaschke's infinitesmal conjecture for complex projective space N84-33049
PROPELLANT BINDERS
3,5,5-trinitro-3-azaheptane-1,7-diol and a method of syntheis
[AD-D011132] N84-32555
PROPELLANT COMBUSTION
Expendable infrared source and method therefor
[AD-D011112] N84-32551
PROPELLANT PROPERTIES
Nonlinear burning stability of solid propellants
[AD-A143573] N84-32554
PROPELLANT TRANSFER
Refueling considerations for liquid-hydrogen fueled vehicles
[DE84-012623] N84-32557
PROPELLER BLADES
Analysis of three-dimensional transonic compressors
[NASA-CR-166580] N84-32356
Application of stiffened cylinder analysis to ATP interior noise studies
[NASA-CR-172384] N84-33147
PROPELLER DRIVE
An investigation of a new flight test method for measuring the performance of general aviation aircraft N84-32375
PROPELLERS
Summary of recent NASA propeller research
[NASA-TM-83733] N84-32344
PROPULSION SYSTEM CONFIGURATIONS
Energy efficient engine component development and integration program
[NASA-CR-173884] N84-32389
Rocket injector anomalies study. Volume 1: Description of the mathematical model and solution procedure
[NASA-CR-174702] N84-32428
Rocket injector anomalies study. Volume 2: Results of parametric studies
[NASA-CR-174703] N84-32429
PROPULSION SYSTEM PERFORMANCE
Energy efficient engine component development and integration program
[NASA-CR-173884] N84-32389
PROPULSIVE EFFICIENCY
An investigation of a new flight test method for measuring the performance of general aviation aircraft N84-32375
PROTECTIVE COATINGS
Chemical vapor deposition of erosion resistant TiB-2 coatings
[DE84-012351] N84-32518
PROTEINS
Unraveling photosystems
[DE84-013612] N84-32994
Microbiology and food program N84-32999
PROTOCOL (COMPUTERS)
The Record of Electrical and Communication Engineering Conversazione, volume 53, no. 1, Jul. 1984
[ISSN-0385-7719] N84-32565
On applications of a specification and description language NESDEL to communication protocols N84-32567
Higher layer protocols for a workstation architecture
[DE84-013649] N84-33067
Updating replicated files in real time distributed processing systems N84-33264
PROVING
Theoretical issues in the design and verification of distributed systems N84-33096
PROXIMITY EFFECT (ELECTRICITY)
The proximity effects of superconducting multilayer film
[AD-A143255] N84-33217
PSYCHOMOTOR PERFORMANCE
Visual field perimeter and psychomotor tracking performance measuring apparatus
[AD-D011056] N84-32775
PULMONARY FUNCTIONS
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010
PULSE COMMUNICATION
Computer-based transmission monitor and control system
[PB84-202068] N84-33069
PULSE COMPRESSION
Plasma switch development
[AD-A143233] N84-32711
PULSE DURATION MODULATION
Universal control grid modulator
[AD-D011108] N84-32672
PULSE GENERATORS
Synchronization tracking in pulse position modulation receiver
[NASA-CASE-NPO-16256-1] N84-32620
PULSE HEATING
Advancement of developmental technology for pulse combustion applications
[PB84-215268] N84-32576
PULSE MODULATION
Synchronization tracking in pulse position modulation receiver
[NASA-CASE-NPO-16256-1] N84-32620
PULSE RATE
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007
PULSED LASERS
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32606
Evaluation of bidirectionally conducting thyratrons for pulsed excimer lasers
[DE84-013690] N84-32618
PULSED RADIATION
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007
Autogenerator of beams of charged particles
[DE84-014242] N84-33163
PULSES
Digital multi-tapped delay line with automatic time-domain programming
[AD-D011136] N84-32676
Large aperture electro-optical switch
[DE84-013089] N84-32728
Characterization of voltage losses during high-intensity current pulses in reactive, porous electrodes of molten salt cells
[DE84-012112] N84-32730
A 50 kJ repetitively pulsed capacitor bank
[DE84-012959] N84-32735
PUMPS
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32850
PURIFICATION
Obtaining iron-55 with high radiochemical purity
[CSIR-TRANS-1751] N84-32494

Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556

PYRIDINES
Investigation of thermal stability of fluorinol-85 and 2-methylpyridine-water as Rankine cycle power system working fluids
[DE84-006420] N84-32559

PYROLYSIS
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
A comparative study in the animal of the toxicity of the combustion products of diverse materials N84-33015

PYROTECHNICS
Effect of thermal aging on the output of a pyrotechnic actuator
[DE84-012903] N84-32558

Q

QUADRATURES
Distribution results for positive definite quadratic forms with repeated roots
[AD-A143450] N84-33115
Optical propagation and communication N84-33355

QUALIFICATIONS
Qualification tests and electrical measurements: Practice and problems N84-32703
Qualification testing and electrical measurement experience: A manufacturer's view N84-32705
Qualification testing for a central station N84-32706

QUALITY
Aircraft, ships, spacecraft, nuclear plants and quality
[DE84-013262] N84-33166

QUALITY CONTROL
Correlational estimation of parameters of solid state microwave devices N84-32609
Physical properties of CdTe films grown by hotwall and molecular beam techniques
[AD-A143180] N84-33214
Scientific and technical information transfer: Issues and options
[RAND/N-2131-NSF] N84-33286

QUANTITATIVE ANALYSIS
Quantitative analysis of satellite infrared imagery using digital storage equipment
[INPE-2978-PRE/440] N84-33074

QUANTUM EFFICIENCY
Quantum transport in low dimensional disordered systems N84-33347

QUANTUM ELECTRODYNAMICS
Relativistic calculations and measurements of energies, Auger rates, and lifetimes
[AD-A143423] N84-33220
Optics and quantum electronics N84-33343

QUANTUM THEORY
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Inelastic strong interactions at high energies
[DE84-013647] N84-33170
Quantum structure of adsorbates on semiconductor surfaces
[AD-A143465] N84-33223
Invariant formulation of and radiative corrections in quantum gravity N84-33249

QUASARS
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314
The broad-band X-ray spectrum of a QSO sample
[NASA-TM-85071] N84-33333

QUATERNARY ALLOYS
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors
[AD-A143551] N84-33225

QUENCHING (ATOMIC PHYSICS)
Chemical reactions, radiative and energy transfer processes of important atmospheric species
[AD-A143264] N84-33156

QUENCHING (COOLING)
Aircraft landing dynamics facility carriage weld test program
[NASA-TM-85802] N84-32627
Plasma-particle interaction effects in induction plasma modelling under dense loading conditions
[DE84-013388] N84-33203
Maximum supercooling in liquid 3He-4He mixtures near the tricritical point
[DE84-010076] N84-33232
Dynamical scaling in 3He-4He liquid mixtures
[DE84-010072] N84-33233

QUERY LANGUAGES
Deduction in nonhorn databases N84-33263

QUEUEING THEORY
The effect of queueing disciplines on response times in distributed systems
[DE84-012639] N84-33066

R

RACETRACKS (PARTICLE ACCELERATORS)
Pulsed power for racetrack induction accelerators
[AD-A143289] N84-33157

RADAR ANTENNAS
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619

RADAR ASTRONOMY
The Telecommunications and Data Acquisition Report
[NASA-CR-173885] N84-32622
High power K sub a -band transmitter for planetary radar and spacecraft uplink N84-32625

RADAR CROSS SECTIONS
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650
Broadside radar cross section of the perfectly conducting cube
[AD-A143321] N84-32656

RADAR DATA
Threshold signals for detector having stabilization of false alarm probability N84-32590

RADAR ECHOES
Cascaded adaptive loops
[AD-D011116] N84-32674

RADAR EQUIPMENT
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651

RADAR IMAGERY
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651

RADAR RECEIVERS
Autocorrelation receiver for Doppler short-range radar systems N84-32589
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 4: Functional specification for the prototype Automated Integrated Receive System (AIRS)
[NASA-CR-175264] N84-32649
High frequency radar software reference manual for product one
[PB84-194865] N84-32665

RADAR TARGETS
Broadside radar cross section of the perfectly conducting cube
[AD-A143321] N84-32656

RADAR TRACKING
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650

RADAR TRANSMITTERS
High power K sub a -band transmitter for planetary radar and spacecraft uplink N84-32625

RADIANT FLUX DENSITY
Expendable infrared source and method therefor
[AD-D011112] N84-32551
The effect of dimensionality on solar spectrum curves
[DE84-014136] N84-33327

RADIATION
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007

RADIATION ABSORPTION
Develop real-time dosimetry concepts and instrumentation for long-term missions
[NASA-CR-171809] N84-32791

RADIATION BELTS
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946

RADIATION DAMAGE
Ion bombardment damage in a modified Fe-9Cr-1Mo steel
[DE84-014288] N84-32522
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995

RADIATION DETECTORS
Development of a spectroradiometer with a linear network of detectors from standard CCD
[INPE-3095-TDL/165] N84-33180

RADIATION DISTRIBUTION
Radiation from intense electron beams associated with the Cherenkov mechanism
[AD-A143350] N84-32657
Time development of Cerenkov radiation
[AD-A143225] N84-33155

RADIATION DOSAGE
Develop real-time dosimetry concepts and instrumentation for long-term missions
[NASA-CR-171809] N84-32791
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010
Visual function and the definition of thresholds for exposure to laser radiation N84-33019

RADIATION EFFECTS
Effective thermophysical and elastic properties of materials with voids
[DE84-013942] N84-32465
Ion bombardment damage in a modified Fe-9Cr-1Mo steel
[DE84-014288] N84-32522
Physical techniques for profiling heterogeneous polymer degradation
[DE84-013607] N84-32547
Develop real-time dosimetry concepts and instrumentation for long-term missions
[NASA-CR-171809] N84-32791

RADIATION HAZARDS
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009

RADIATION MEASUREMENT
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007

RADIATION SOURCES
Expendable infrared source and method therefor
[AD-D011112] N84-32551
Angular resolution of coherent and noncoherent sources
[AD-A143287] N84-33129

RADIATIVE TRANSFER
Wave propagation in dense geophysical media
[AD-A143213] N84-32955

RADIO ANTENNAS
Tactical high frequency array antennas
[AD-D011095] N84-32717

RADIO ASTRONOMY
Radio astronomy N84-33349

RADIO BEACONS
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 1: System description and test results
[PB84-184621] N84-32412
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 2: Hardware circuitry and software programs
[PB84-184639] N84-32413

RADIO FREQUENCIES
A high-performance hybrid RF isolation amplifier N84-32623
The 64-m antenna automatic subreflector focusing controller N84-32626
Radio frequency distribution assembly
[AD-A143575] N84-32658
INTERMD: A computer program to predict intermodulation product generation on two-way FM radio frequencies
[DE84-013767] N84-32661
High-power RF compressor
[DE84-013118] N84-32664
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies
[AD-A143507] N84-32992
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007

RADIO INTERFEROMETERS
Tropospheric delay effects in radio interferometry N84-32636

RADIO NAVIGATION
The Telecommunications and Data Acquisition Report
[NASA-CR-173885] N84-32622

RADIO RECEPTION
Concerning power recovered by receiving antenna from incident field N84-32584

RADIO SIGNALS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Tropospheric delay effects in radio interferometry N84-32636

RADIO TRANSMISSION
HF prediction using adiabatic invariant theory
[AD-A143230] N84-32852
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-901806] N84-33329
RADIO WAVE REFRACTION
Intensity of radiowave scattering on anisotropic irregularities with various positions of scattering volume about caustic zone N84-32585
RADIOACTIVE ISOTOPES
Calibration and performance of a high-resolution gamma-spectroscopy system
[DE84-012782] N84-32482
RADIOACTIVE WASTES
Mechanical seal program
[DE84-013421] N84-32838
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States
[DE84-013672] N84-32901
RADIOBIOLOGY
Effects of insulin and hydrocortisone on energy metabolism in rats irradiated with fast, 60 MeV neutrons N84-33002
RADIOCHEMICAL SEPARATION
Obtaining iron-55 with high radiochemical purity
[CSIR-TRANS-1751] N84-32484
RADIOCHEMISTRY
Obtaining iron-55 with high radiochemical purity
[CSIR-TRANS-1751] N84-32484
RAILS
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83795] N84-32789
RAIN
Microwave terrestrial link rain attenuation prediction parameter analysis
[PB84-207964] N84-32666
RAMAN SPECTRA
The interpretation of very low frequency Raman scattering from roughened silver electrodes: Clusters, cavities or complexes?
[AD-A143471] N84-33184
RAMAN SPECTROSCOPY
Raman and infrared spectroscopy of molecules adsorbed on metal electrodes
[AD-A143468] N84-32454
Highly sensitive high resolution Raman spectroscopy using resonant ionization methods
[DE84-012240] N84-32480
RANDOM ACCESS
COSMIC/NASTRAN free-field input N84-32665
RANDOM ACCESS MEMORY
Test procedures and design methods for reliable large scale integrated circuits and systems
[AD-A143324] N84-33061
RANDOM LOADS
Random vibrations of multicomponent structures N84-32654
RANDOM SIGNALS
Relations between algorithms of adaptive optimization of antenna arrays and algorithms of optimum detection of multidimensional stochastic signal N84-32568
RANDOM VARIABLES
Distribution results for positive definite quadratic forms with repeated roots
[AD-A143450] N84-33115
Distributions of central quadratic forms in normal variables: A comparison of algorithms
[AD-A143468] N84-33116
Variability orderings related to coverage problems on the circle
[AD-A143364] N84-33130
One-sided r-reliable intervals and their associated confidences on the sum of two Continuous/Independent, random variables
[AD-A143367] N84-33131
TP2 orderings
[AD-A143434] N84-33132
Kolmogorov's and Mourier's strong laws for arrays with independent and identically distributed columns
[AD-A143222] N84-33139
RANDOM VIBRATION
Random vibrations of multicomponent structures N84-32654
RANDOM WALK
Brownian motion and random walks on manifolds N84-33051
RANK TESTS
Asymptotic relative efficiencies of the rank transformation procedure in randomized complete block designs
[DE84-010600] N84-33134
RANKINE CYCLE
Investigation of thermal stability of fluorinol-85 and 2-methylpyridine-water as Rankine cycle power system working fluids
[DE84-006430] N84-32589
Steam bottoming cycle for an adiabatic diesel engine
[NASA-CR-168255] N84-33304
RAPID QUENCHING (METALLURGY)
Processing and consolidation of rapidly solidified alloys: A technology assessment
[DE84-014673] N84-32523
RARE EARTH COMPOUNDS
New materials from high temperature synthesis
[DE84-014128] N84-33231
RATES (PER TIME)
A procedure for determining the tempo at which alloys solidify
[BLL-M-35642-(5828.4)] N84-32497
A strategy for successful deep space information transmission in bad weather N84-32535
RAY TRACING
The correction of aberrations computed in the aperture plane of multifrequency microwave radiometer antennas
[NASA-TM-86090] N84-32679
REACTION KINETICS
GCKP84-general chemical kinetics code for gas-phase flow and batch processes including heat transfer effects
[NASA-TP-2320] N84-32446
A comprehensive chemical kinetic reaction mechanism for the oxidation of n-butane
[DE84-006736] N84-32467
Solid-phase reaction of dispersed graphitized material with aluminium and nickel
[BLL-M-35633-(5828.4)] N84-32482
On-site measurement of the speed of corrosion of a metal in water
[BLL-T6910/BG/WH770/84] N84-32486
Topochemical reactions and the Stefan problem
[BLL-M-35571-(5828.4)] N84-32501
Diamond synthesis from various graphites
[CSIR-TRANS-1749] N84-32526
Technique for measuring gas conversion factors
[NASA-CASE-LAR-13220-1] N84-32786
Wafer-scale laser pantography. Part 6: Direct-write interconnection of VLSI gate arrays
[DE84-012676] N84-32815
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers
[AD-A143319] N84-32959
Chemical reactions, radiative and energy transfer processes of important atmospheric species
[AD-A143264] N84-33156
Chemical reaction dynamics at surfaces N84-33340
REACTOR MATERIALS
Effective thermophysical and elastic properties of materials with voids
[DE84-013942] N84-32465
READ-ONLY MEMORY DEVICES
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 3: Performance and simulation
[NASA-CR-175263] N84-32648
REAL TIME OPERATION
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 1: Executive summary
[NASA-CR-175261] N84-32646
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 2: Design and development
[NASA-CR-175262] N84-32647
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 3: Performance and simulation
[NASA-CR-175263] N84-32648
Verification of hourly forecasts of wind turbine power output
[PNL-4900] N84-32914
The severity of the Brazilian freeze of 1981 as monitored in real time by satellite
[INPE-2586-PRE/234] N84-32967
Array processor utilization in the computation of real-time images
[ARL-SYS-TM-73] N84-33058
Summary of research performed at MIT Laboratory for Computer Science
[AD-A143459] N84-33064
System analysis for the Huntsville Operational Support Center distributed computer system
[NASA-CR-171136] N84-33097
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172
Varying bandpass of optical spatial filter by rotating mirrors having changing reflectivity
[AD-D011114] N84-33173
Updating replicated files in real time distributed processing systems N84-33264
REAL VARIABLES
Wave fronts to infinity of real analytic functions N84-33031
RECEIVERS
Intermodulation distortions in semiconductor microwave receivers and transmitters (survey) N84-32606
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 1: Executive summary
[NASA-CR-175261] N84-32646
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 2: Design and development
[NASA-CR-175262] N84-32647
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 3: Performance and simulation
[NASA-CR-175263] N84-32648
RECEIVING
Numerical calculations of the function of the static receptivity of electrons in metals
[BLL-M-35640-(5828.4)] N84-32480
RECRYSTALLIZATION
Submicron structures technology and research N84-33353
RECTANGULAR PLANFORMS
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32654
RECTANGULAR WAVEGUIDES
Compact broadband rectangular to coaxial waveguide junction
[AD-D011091] N84-32716
RECTANGULAR WINGS
Subsonic and transonic unsteady- and steady-pressure measurements on a rectangular supercritical wing oscillated in pitch --- wind tunnel tests
[NASA-TM-85765] N84-32348
REDOX CELLS
Negative electrode catalyst for the iron-chromium REDOX energy storage system
[NASA-CASE-LEW-14028-1] N84-32909
REDUCED GRAVITY
Development of the sonic pump levitation
[NASA-CR-161063] N84-32749
REDUCTION (CHEMISTRY)
Adsorbent regenerator
[DE84-012969] N84-32468
Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition
[AD-A143361] N84-33219
REDUNDANCY
Optimal measurement of ice-sheet deformation from surface-marker arrays
[NASA-CR-173877] N84-32950
REENTRY
Columbia: The first five flights. Entry heating data series. Volume 6: The upper leeside surface centerline
[NASA-CR-171795] N84-32414
REENTRY EFFECTS
Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506
Effect of alloy chemistry and exposure conditions on the oxidation of titanium
[NASA-TM-86295] N84-32507
REENTRY PHYSICS
Columbia: The first five flights. Entry heating data series. Volume 6: The upper leeside surface centerline
[NASA-CR-171795] N84-32414
REENTRY SHIELDING
Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506
REFERENCE SYSTEMS
Adaptive subject description in document retrieval N84-33298
REFINING
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173897] N84-33213
REFLECTANCE
Remote sensing for geobotanical prospecting N84-32669
REFLECTION
Preliminary design of a 10-kW thermophotovoltaic system for space applications
[NASA-TM-83768] N84-32427

Focusing twist reflector for electron-cyclotron resonance heating in the Tandem Mirror Experiment-upgrade [DE84-012954] N84-32663

REFLECTORS
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control [NASA-CR-173878] N84-33315

REFRACTIVITY
Reflection of electromagnetic waves from inhomogeneous media N84-32586
Infrared absorption spectrum of free carriers in polar semiconductors [DE84-013276] N84-33248

REFRACTORY MATERIALS
The nature and origin of refractory inclusions in the Allende meteorite N84-33318

REFRACTORY METAL ALLOYS
Influence of direct current on temperature gradient in directionally solidifying ingot of alloy YuNDK35T5 [BLL-M-35684-(5828.4)] N84-32495

REFRIGERATORS
Magnetic refrigeration development N84-32626

REFUELING
The feasibility, practicality and utility of P-3 inflight refueling [AD-A143419] N84-32382
Refueling considerations for liquid-hydrogen fueled vehicles [DE84-012623] N84-32557

REGENERATION (ENGINEERING)
Adsorbent regenerator [DE84-012969] N84-32468

REGENERATORS
High temperature metallic recuperator [PB84-207869] N84-32575

REGRESSION ANALYSIS
Using statistical tools [RAND/N-2121-PSSP] N84-33124
Robust C(Alpha)-type tests for linear models [AD-A143177] N84-33125
Bounded-influence inference in regression [AD-A143195] N84-33126
Robust model selection in regression [AD-A143209] N84-33127

REGRESSION COEFFICIENTS
Development of color criteria for advanced displays [AD-A143246] N84-33006

REGULATIONS
Legislation needed to clarify future of consumer protection and federal preemption after the Civil Aeronautics Board sunsets [PB84-210103] N84-32371
Evaluation and control of laser hazards N84-33018

RELATIONSHIPS
An exploratory analysis of the relationship between media richness and managerial information processing [AD-A143503] N84-33293

RELATIVISTIC ELECTRON BEAMS
Autogenerator of beams of charged particles [DE84-014242] N84-33163
Experimental investigation of certain beam transport issues in a pulsed transmission line linear accelerator [DE84-011191] N84-33164
Plasma dynamics N84-33354

RELATIVISTIC PLASMAS
Propagation and absorption of electromagnetic waves in fully relativistic plasmas [DE84-013627] N84-33204

RELAXATION (MECHANICS)
An entropy maximum principle and relaxation phenomena [AD-A143531] N84-33250

RELIABILITY
Processing science to increase the reliability of ceramics [AD-A143207] N84-32539
Effect of processing conditions on the reliability of crosslinked polyethlene cable insulation [DE84-014902] N84-32546
An evaluation of two reliability and maintainability information systems [AD-A143438] N84-33290

RELIABILITY ANALYSIS
A study of DSN traveling wave maser system reliability N84-32640

REMOTE CONSOLES
Higher layer protocols for a workstation architecture [DE84-013649] N84-33087

REMOTE SENSING
Development and characterization analysis of a radar polarimeter [NASA-CR-175259] N84-32785
Remote sensing for geobotanical prospecting N84-32889
Pilot study and evaluation of a SMMR-derived sea ice data base [NASA-CR-175255] N84-32896
Determination of sea surface temperature with N-ROSS (Navy-Remote Ocean Sensing System) [AD-A143563] N84-32964
Electromagnetic wave theory and remote sensing N84-33350

REMOTE SENSORS
A simulation of remote sensor systems and data processing algorithms for spectral feature classification [NASA-CR-172393] N84-32784

REMOVAL
Observation of advanced particle removal rates in pump limiter simulation experiments [DE84-014327] N84-33202

RENDEZVOUS GUIDANCE
Ku-Band rendezvous radar performance computer simulation model [NASA-CR-171804] N84-32650

REPEATERS
The 1.4 gb/s optical repeater development [AD-A143331] N84-33182

REPETITION
Pulse driver for flux gate magnetometer [AD-D011053] N84-32774

REPORTS
Status tracking system for reports N84-33276

REQUIREMENTS
Physical properties of CdTe films grown by hotwall and molecular beam techniques [AD-A143180] N84-33214

RESCUE OPERATIONS
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 1: System description and test results [PB84-184621] N84-32412
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 2: Hardware circuitry and software programs [PB84-184639] N84-32413

RESEARCH
Physics in Europe: A data file of selected research [AD-A143426] N84-33289

RESEARCH AIRCRAFT
Future requirements for airborne simulation [AGARD-AR-188] N84-32401

RESEARCH AND DEVELOPMENT
Plasma switch development [AD-A143233] N84-32711
Quantitative treatment of fuzzy relations in the process of allocating resources to R and D projects [INPE-2761-PRE/336] N84-33251
Oversight on the Federal Aviation Administration fiscal year 1985 research, engineering and development budget request [GPO-34-924] N84-33302
Custom integrated circuits N84-33361
NASA Ames summary high school apprenticeship research program, 1983 research papers [NASA-TM-85931] N84-33365

RESEARCH FACILITIES
Studies in a transonic rotor aerodynamics and noise facility [NASA-CR-166586] N84-32399
Laser furnace technology for zone refining [NASA-TM-86459] N84-32805

RESEARCH MANAGEMENT
The NASA photovoltaic technology program [NASA-TM-83685] N84-32426
Summary status of advanced water electrolysis and hydrogen storage/transport research and development [DE84-012908] N84-32456
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1 [AD-A143248] N84-32830
European scientific notes, Volume 38, Number 7 [AD-A143238] N84-33287

RESEARCH PROJECTS
Technology Base Research Project for Electrochemical Energy Storage [DE84-013677] N84-32930

RESIDENTIAL ENERGY
High efficiency heat pump using ground heat source [DE84-006385] N84-32761

RESISTORS
Measurement amplifier [NASA-CASE-MFS-25868-1] N84-32680
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 6 [NASA-CR-171126] N84-32780

RESOLUTION
Multivariate curve resolution in liquid chromatography [DE84-013797] N84-32466

RESONANCE
Highly sensitive high resolution Raman spectroscopy using resonant ionization methods [DE84-012240] N84-32460

RESONANT FREQUENCIES
A study of the high frequency limitations of series resonant converters [NASA-CR-173868] N84-32678
Experimental investigation of certain beam transport issues in a pulsed transmission line linear accelerator [DE84-011191] N84-33164

RESONANT VIBRATION
Structural analysis of the support system for a large compressor driven by a synchronous electric motor N84-32873

RESOURCES MANAGEMENT
Agriculture and water use: Present and future issues [GPO-30-599] N84-32897
Quantitative treatment of fuzzy relations in the process of allocating resources to R and D projects [INPE-2761-PRE/336] N84-33251

RESPONSES
The effect of queueing disciplines on response times in distributed systems [DE84-012639] N84-33086

RESTORATION
Availability of the DSN telemetry data system and its major elements, including the TWM assemblies N84-32639
A study of DSN traveling wave maser system reliability N84-32640

RETORT PROCESSING
Solar-heated oil shale retort [NASA-CASE-NPO-16392-1] N84-32912

REVERBERATION
High-frequency acoustic backscatter from the sea surface [AD-A143536] N84-33152

REVERSE FIELD PINCH
Thermal instabilities in the edge region of reversed-field pinches [DE84-013861] N84-33196

REYNOLDS NUMBER
Report of tests of a compressor configuration of CD (Controlled Diffusion) blading [AD-A143499] N84-32832

RIEMANN MANIFOLD
Infinitesimal deformation of locally symmetrical Riemann spaces. 2: Blaschke's infinitesimal conjecture for complex projective space N84-33049
Brownian motion and random walks on manifolds N84-33051
Harmonic maps from S-2 to IHP-2 N84-33109

RING CURRENTS
MAGSAT correlations with geoid anomalies - magnetic anomalies in the western Gulf of Mexico [E84-10190] N84-32994

RING LASERS
Quantum optics and photonics N84-33344

RING STRUCTURES
Grounding ring for shielded cable [AD-D011135] N84-32675

RINGS
Engine wear with methanol fuel in a nitrogen-free environment [AD-A143530] N84-32833

RISERS
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32975

ROBOTICS
Artificial Intelligence-Robotics applications to Navy aircraft maintenance [AD-A143219] N84-32345
Impact of robots and computers on the work force of the 1980's [GPO-31-912] N84-32826
Uncertainty covariances in robotics applications [DE84-013417] N84-32843
Robotisation of dye penetrant inspection: A study of a prototype and its development [BLL-RISLEY-TRANS-4585-(9091.9)] N84-32847

ROBOTS
Uncertainty covariances in robotics applications [DE84-013417] N84-32843

ROBUSTNESS (MATHEMATICS)
Robust C(Alpha)-type tests for linear models [AD-A143177] N84-33125
Robust model selection in regression [AD-A143209] N84-33127

ROCKET ENGINES
Rocket injector anomalies study. Volume 1: Description of the mathematical model and solution procedure [NASA-CR-174702] N84-32429

ROCKS
Geology, petrology and geochronology of the metamorphic rocks of Mestiq Dome, Central Eastern Desert, Egypt N84-32942
Paleomagnetism, rock magnetism and diagenesis in hemipelagic sediments from the northeast Pacific Ocean and the Gulf of California N84-32944
ROLLER BEARINGS
Thermal analysis of a planetary transmission with spherical roller bearings operating after complete loss of oil
[NASA-TP-2367] N84-32824
ROOFS
Preliminary guidelines for maintenance of polyurethane foam (PUF) roofing systems
[AD-A143458] N84-32543
ROOTS
Distribution results for positive definite quadratic forms with repeated roots
[AD-A143450] N84-33115
ROSS ICE SHELF
Optimal measurement of ice-sheet deformation from surface-marker arrays
[NASA-CR-173877] N84-32950
ROTARY ENGINES
Comparison between two Lysholm engines
[DE84-013696] N84-32571
Development of partially fluorinated resin apex seals
[NASA-CR-174706] N84-32828
ROTATING BODIES
Four new capabilities in NASTRAN for dynamic and aeroelastic analyses of rotating cyclic structures N84-32676
Dynamics of angular movements of a solid supporting a rotating rotor with consideration of energy dissipation
[AD-A143349] N84-32681
ROTATING CYLINDERS
The chemical and physical changes on lubricated surfaces N84-32820
ROTATING GENERATORS
Investigation of Doubly-Fed Machine in Variable Speed Applications
[DE84-012943] N84-32928
ROTATING MIRRORS
Varying bandpass of optical spatial filter by rotating mirrors having changing reflectivity
[AD-D011114] N84-33173
ROTATION
Pulsed hydrogen-fluoride laser
[MRL-R-831] N84-32803
Shaft positioning device
[AD-D011067] N84-32836
Simplifications in the simulation of mechanisms containing flexible members N84-32855
Basic principles and recent observations of rotationally sampled wind
[DE84-013267] N84-32976
ROTOR AERODYNAMICS
An integral equation for the solution of nonlinear wave equations N84-32347
A mathematical simulation model of the CH-46B helicopter, volume 2
[NASA-TM-84351] N84-32380
Studies in a transonic rotor aerodynamics and noise facility
[NASA-CR-166588] N84-32399
ROTOR BLADES (TURBOMACHINERY)
JT15D simulated flight data evaluation
[NASA-CR-172322] N84-32387
Studies in a transonic rotor aerodynamics and noise facility
[NASA-CR-166588] N84-32399
ROTOR SYSTEMS RESEARCH AIRCRAFT
NASA rotor system research aircraft flight-test data report: Helicopter and compound configuration
[NASA-TM-85843] N84-32381
ROTORS
Calculation of the pressure distribution on a pitching airfoil with application to the Darrieus rotor
[DE84-013571] N84-32363
Altering the volumetric expansion ratio of a Lysholm helical screw expander
[DE84-013695] N84-32573
Empirical modeling of a Lysholm helical screw expander
[DE84-013694] N84-32574
Dynamics of angular movements of a solid supporting a rotating rotor with consideration of energy dissipation
[AD-A143349] N84-32681
ROUTES
Microcomputers in transportation: Software and source book
[PB84-195155] N84-33067
RUNGE-KUTTA METHOD
Some practical Runge-Kutta formulas
[DE84-013539] N84-33123
RUNWAY CONDITIONS
Warm fog dissipation using large volume water sprays
[NASA-CASE-MFS-25962-1] N84-32398
RUNWAYS
Warm fog dissipation using large volume water sprays
[NASA-CASE-MFS-25962-1] N84-32398
Modified reflex-percussive grooves for runways
[AD-A143569] N84-32400
RUPTURING
Probabilistic models of the stress-rupture of composite materials: Summary
[DE84-013477] N84-32441
RYDBERG SERIES
Atomic resonance and scattering N84-33339

S

SADDLES (SUPPORTS)
Horizontal cylindrical vessels supported by saddles subjected to vertical and lateral force fields N84-32858
SAFETY
DC wiring system grounding and ground fault protection issues for central station photovoltaic power plants N84-32695
Electrical safety for high voltage arrays N84-32697
Evaluation and control of laser hazards N84-33018
SALINITY
Hydrographic measurements in the western Arboran Sea, October 1982
[AD-A143588] N84-32985
SAMPLERS
Compendium of selected methods for sampling and analysis at geothermal facilities
[PB84-199926] N84-32579
SAMPLING
Compendium of selected methods for sampling and analysis at geothermal facilities
[PB84-199926] N84-32579
SAN FRANCISCO (CA)
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892
SANDSTONES
Systematic jointing in the cardium sandstone along the Bow River, Alberta, Canada N84-32937
Petrography and ultrasonic wave velocity in the Admire Formation (Permian), Kansas N84-32945
SARSAT
Satellite activities of NOAA, 1983 N84-32408
SATELLITE DESIGN
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control
[NASA-CR-173878] N84-33315
SATELLITE IMAGERY
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892
LANDSAT-4 image data quality analysis — LANDSAT 5 imagery
[E84-10173] N84-32893
Quantitative analysis of satellite infrared imagery using digital storage equipment
[INPE-2978-PRE/440] N84-33074
SATELLITE INSTRUMENTS
Determination of sea surface temperature with N-ROSS (Navy-Remote Ocean Sensing System)
[AD-A143563] N84-32984
SATELLITE NETWORKS
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 1: System description and test results
[PB84-184621] N84-32412
SATELLITE OBSERVATION
DCP systems and characteristics
[INPE-2948-PRE/431] N84-32899
SATELLITE ORBITS
Comparison of analytical theories for studying the contraction of artificial satellite orbits
[INPE-2746-PRE/322] N84-32409
SATELLITE PERTURBATION
Comparison of analytical theories for studying the contraction of artificial satellite orbits
[INPE-2746-PRE/322] N84-32409
SATELLITE TRACKING
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650
SATELLITE TRANSMISSION
Electronic Switching Spherical Array (ESSA) antenna systems
[NASA-TM-86127] N84-32621
SATURN RINGS
Trapped particle absorption by the Ring of Jupiter
[NASA-CR-173919] N84-33323
SCALING
Diffusion modeling with convective scaling and effects of surface inhomogeneities
[PB84-210053] N84-32981
SCANNERS
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83785] N84-32789
SCATTER PLATES (OPTICS)
Practical problems with CO2 laser radar tests
[RAE-TRANS-2113] N84-32804
SCATTERING
Design of locked microwave oscillators on basis of scattering parameters of transistors operating in large signal mode N84-32608
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946
Radial distribution function as an analysis technique
[DE84-013242] N84-33235
SCHEDULING
Status tracking system for reports N84-33276
SCHOTTKY DIODES
Schottky barrier and homojunction gallium arsenide solar cells N84-32907
SCINTILLATION COUNTERS
High energy physics research at Texas Agriculture and Mining University — magnetic monopoles in cosmic rays and hadron calorimeter design
[DE84-011616] N84-33167
SCREWS
Altering the volumetric expansion ratio of a Lysholm helical screw expander
[DE84-013695] N84-32573
Empirical modeling of a Lysholm helical screw expander
[DE84-013694] N84-32574
SEA ICE
Pilot study and evaluation of a SMMR-derived sea ice data base
[NASA-CR-175255] N84-32896
Bering Air-Sea-Ice Study (BASICS), February and March, 1981
[PB84-196161] N84-32903
SEA WATER
Reference plant for high temperature electrodialysis desalting of seawater
[PB84-195841] N84-32471
Stress corrosion cracking of stainless steels in sea water at ambient temperature
[BLL-RISLEY-TRANS-4556-(9091.9)] N84-32476
Stress corrosion cracking of austenitic stainless steels in sea water: An investigation of test methods
[BLL-RISLEY-TRANS-4568-(9091.9)] N84-32478
Hydrographic measurements in the western Arboran Sea, October 1982
[AD-A143588] N84-32985
SEALS (STOPPERS)
Pin rooted blade biaxial air seal
[AD-D011066] N84-32391
Linear motion valve
[NASA-CASE-MSC-20148-1] N84-32823
Development of partially fluorinated resin apex seals
[NASA-CR-174706] N84-32828
Materials testing of the IUS techroll seal material
[NASA-TM-86462] N84-32829
Mechanical seal program
[DE84-012421] N84-32838
SEARCH PROFILES
Search command for character strings and words in computer files on CMS (Conversational Monitor System)
[PB84-201243] N84-33068
SEDIMENT TRANSPORT
Aggradation and degradation at alluvial-channel beds
[PB84-201557] N84-32905
SEDIMENTARY ROCKS
Stratigraphy and sedimentology of the upper Proterozoic Kingston Peak Formation, Panamint Range, eastern California N84-32939
Lower tertiary biostratigraphy and paleoecology of the Quilcene-Discovery Bay area, northeast Olympic Peninsula, Washington N84-32943
SEDIMENTS
Paleomagnetism, rock magnetism and diagenesis in hemipelagic sediments from the northeast Pacific Ocean and the Gulf of California N84-32944
SEISMIC WAVES
The development of methods to predict both the dynamic and the pseudo-static response of secondary structures subjected to seismic excitations
[DE84-010284] N84-32884

SEISMOGRAPHS
Development of the model 52500 strain-inertial seismometer system (prototype)
[AD-A143572] N84-32961
SEISMOLOGY
Seismic analysis capability in NASTRAN N84-32871
Seismic hazard study for selected sites in New Mexico and Nevada
[AD-A143392] N84-32960
SELF ERECTING DEVICES
Foldable self-erecting joint — space erectable structures
[NASA-CASE-MSC-20635-1] N84-32424
SEMICIRCULAR CANALS
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33016
SEMICONDUCTOR DEVICES
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Intermodulation in protective semiconductor microwave devices N84-32612
Infrared nonlinear optics N84-33346
SEMICONDUCTOR DIODES
Design and selection of bypass diodes N84-32688
Development of long wavelength semiconductor diode lasers near 28 microns for use in infrared heterodyne spectrometers
[NASA-CR-175253] N84-32802
SEMICONDUCTOR LASERS
The Record of Electrical and Communication Engineering Conversazione, volume 53, no. 1, Jul. 1984
[ISSN-0385-7719] N84-32565
A study on accurate frequency-control of semiconductor lasers N84-32566
Development of long wavelength semiconductor diode lasers near 28 microns for use in infrared heterodyne spectrometers
[NASA-CR-175253] N84-32802
Optical propagation and communication N84-33355
SEMICONDUCTORS (MATERIALS)
The friction behavior of semiconductors Si and GaAs in contact with pure metals
[NASA-TM-83779] N84-32531
Laser furnace technology for zone refining
[NASA-TM-86459] N84-32805
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173897] N84-33213
Basic problems in InP technology
[AD-A143456] N84-33222
Quantum structure of adsorbates on semiconductor surfaces
[AD-A143465] N84-33223
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors
[AD-A143551] N84-33225
Formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules
[AD-A143552] N84-33226
Non-destructive testing of semiconductors using surface acoustic wave
[AD-A143559] N84-33228
Process for the epitaxial deposition of III-V compounds utilizing a binary alloy as the metallic source
[AD-D011097] N84-33229
Local electronic properties of semiconductor surfaces and interfaces
[DE84-013608] N84-33239
Infrared absorption spectrum of free carriers in polar semiconductors
[DE84-013276] N84-33248
RLE Progress Report no. 126
[RLE-PR-126] N84-33336
Semiconductor surface studies N84-33338
SENSITIVITY
Estimation of sensitivity threshold in integrating analog-to-digital converters with averaging of readings N84-32593
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010
SEPARATED FLOW
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85960] N84-32358
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
SERIES (MATHEMATICS)
Symbolic dynamics and nonlinear semiflows
[AD-A143487] N84-33117
SERIES EXPANSION
Horizontal cylindrical vessels supported by saddles subjected to vertical and lateral force fields N84-32858
SEROTONIN
Mechanisms of thermoregulation of rats exposed to hypergravic fields N84-32989
SERVICE LIFE
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner
[NASA-CR-174691] N84-32504
Investigation and rehabilitation to extend service life of DSS-13 antenna concrete foundation N84-32637
Evaluation of bidirectionally conducting thyratrons for pulsed excimer lasers
[DE84-013890] N84-32818
SERVOCONTROL
Design of a high-performance slide and drive system for a small precision machining research lathe
[DE84-011059] N84-32845
SERVOMECHANISMS
Design of a high-performance slide and drive system for a small precision machining research lathe
[DE84-011059] N84-32845
SET THEORY
Solving low density knapsacks
[DE84-006964] N84-33085
Quantitative treatment of fuzzy relations in the process of allocating resources to R and D projects
[INPE-2761-PRE/336] N84-33251
SEYFERT GALAXIES
The broad-band X-ray spectrum of a QSO sample
[NASA-TM-85071] N84-33333
SHADOWGRAPH PHOTOGRAPHY
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 3: Shadowgraph photos and facility description
[NASA-CR-168234-VOL-3] N84-33150
SHAFTS (MACHINE ELEMENTS)
Shaft positioning device
[AD-D011087] N84-32836
Dynamics of angular movements of a solid supporting a rotating rotor with consideration of energy dissipation
[AD-A143349] N84-32881
SHALE OIL
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
SHALES
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
SHALLOW WATER
High-frequency acoustic backscatter from the sea surface
[AD-A143536] N84-33152
SHEAR STRESS
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85960] N84-32358
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197995] N84-32773
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
Analysis of dynamic mixed-mode crack tip stress patterns
[AD-A143329] N84-32880
SHELL THEORY
Free bulging of round diaphragm exposed to uniform pressure in state of creep
[BLL-M-35680-(5828.4)] N84-32861
SHIFT REGISTERS
Digital multi-tapped delay line with automatic time-domain programming
[AD-D011136] N84-32676
SHIPS
Aircraft, ships, spacecraft, nuclear plants and quality
[DE84-013262] N84-33166
SHOCK (PHYSIOLOGY)
Modeling of lethal electric shock N84-33000
SHOCK WAVE PROPAGATION
Numerical solutions of acoustic wave propagation problems using Euler computations
[NASA-CR-172434] N84-33112
SHOCK WAVES
Expendable infrared source and method therefor
[AD-D011112] N84-32551
SHORELINES
Historical and projected shoreline changes: Ocean City and north Assateague Island, Maryland
[PB84-190206] N84-32987
SHORT TAKEOFF AIRCRAFT
A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers
[NASA-TM-85873] N84-32393
SHORT WAVE RADIO TRANSMISSION
Simulator-probe for diagnostic testing of short-wave radio channels N84-32595
SIDELOBES
Cascaded adaptive loops
[AD-D011116] N84-32674
SIGNAL ANALYSIS
The role of the reflection coefficient in precision measurement of ultrasonic attenuation
[NASA-TM-83786] N84-32849
SIGNAL DETECTION
Angle resolution of wideband signals received by two slightly diverse linear antenna arrays N84-32582
Relations between algorithms of adaptive optimization of antenna arrays and algorithms of optimum detection of multidimensional stochastic signal N84-32588
Threshold signals for detector having stabilization of false alarm probability N84-32590
Random signal recognition based on spectral moments N84-32597
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
SIGNAL DETECTORS
Signal waveform detector using synthetic FM demodulation
[AD-D011055] N84-32618
SIGNAL DISTORTION
Simulator-probe for diagnostic testing of short-wave radio channels N84-32595
Intermodulation distortions in semiconductor microwave receivers and transmitters (survey) N84-32605
SIGNAL ENCODING
A strategy for successful deep space information transmission in bad weather N84-32635
SIGNAL MEASUREMENT
Three-wire static strain gage apparatus
[AD-D011130] N84-32776
SIGNAL MIXING
Manipulation of the mixing process between streams of different velocity and temperature in the presence of pressure gradient
[AD-A143467] N84-32757
SIGNAL PROCESSING
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 2: Hardware circuitry and software programs
[PB84-184639] N84-32413
Underwater depth telemetry
[AD-D011054] N84-32418
Random signal recognition based on spectral moments N84-32597
A transportable satellite Earth station
[BBC-RD-1984/8] N84-32614
Signal waveform detector using synthetic FM demodulation
[AD-D011055] N84-32618
INTERMD: A computer program to predict intermodulation product generation on two-way FM radio frequencies
[DE84-013767] N84-32661
Programmable signal processing device
[AD-D011109] N84-32673
Research in monolithic, signal-processing circuits
[AD-A143204] N84-32709
Development and characterization analysis of a radar polarimeter
[NASA-CR-175259] N84-32785
Sensor correlation and data fusion theory
[AD-A143587] N84-33133
Sweden: Optical fiber carries laser power for welding N84-33144
Microwave and quantum magnetics N84-33348
Digital signal processing N84-33357
SIGNAL TO NOISE RATIOS
Threshold signals for detector having stabilization of false alarm probability N84-32590
Symbol-stream combiner: Description and demonstration plans N84-32632
Development of the model 52500 strain-inertial seismometer system (prototype)
[AD-A143572] N84-32961
Phase-only optical filter for use in an optical correlation system
[AD-D011093] N84-33187
SIGNAL TRANSMISSION
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580

SILICON
The friction behavior of semiconductors Si and GaAs in contact with pure metals
[NASA-TM-83779] N84-32531
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173697] N84-33213
Infrared nonlinear optics N84-33346
Electronic properties of amorphous silicon dioxide N84-33351

SILICON CARBIDES
Method for forming fibrous silicon carbide insulating material
[DE84-014658] N84-32442
The controlling reactions during interaction between silicon and carbon
[BLL-M-35673-(5828.4)] N84-32444
Ceramic component manufacturing technology development — silicon carbide tubing for industrial waste heat recovery
[PB84-215276] N84-32550

SILICON FILMS
Low temperature epitaxial deposition of silicon by plasma enhanced CVD (Chemical Vapor Deposition)
[AD-A143208] N84-33216
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246

SILICON NITRIDES
Cubic silicon nitride in iron-silicon steels
[BLL-M-35653-(5828.4)] N84-32486
RF sputtered silicon and hafnium nitrides as applied to 440C steel
[NASA-TM-86862] N84-32536

SILICON OXIDES
Influence of the interfacial layer on electrooptical properties of heterojunction solar cells
[DE84-013265] N84-32925

SILICONES
Structural pressure sensitive silicone adhesives
[NASA-CASE-LAR-13270-1] N84-32532

SILVER
The interpretation of very low frequency Raman scattering from roughened silver electrodes: Clusters, cavities or complexes?
[AD-A143471] N84-33184
Electron localization and superconductivity of very thin epitaxially grown ag films on ge(001)
[AD-A143469] N84-33224

SIMULATION
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619
A simulation of remote sensor systems and data processing algorithms for spectral feature classification
[NASA-CR-172303] N84-32784
Simulation of large networks of processors by smaller ones
[AD-A143529] N84-33098
Target for optically activated seekers and trackers
[AD-D011059] N84-33171

SIMULATORS
Simulator-probe for diagnostic testing of short-wave radio channels N84-32595

SINGLE CRYSTALS
Mechanisms of electrical conductivity in olivine
[DE83-017313] N84-32723
Investigation of optical fibers for nonlinear optics
[AD-A143565] N84-33185
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors
[INPE-3045-TDL/157] N84-33212
Defect clusters and electrical properties in transition metal monoxides
[DE84-014851] N84-33242
Chemical reaction dynamics at surfaces N84-33340

SINGLE SIDEBAND TRANSMISSION
Simultaneous detection of time coincident signals in an adaptive Doppler tracker
[AD-D011092] N84-32659

SINGULARITY (MATHEMATICS)
Singularities connected with a trace on a Banach algebra N84-33094
Persistence of the Hopf bifurcation under singular perturbations
[DE84-013671] N84-33120

SINTERING
Sintered hard metal alloys and process for their manufacture
[CSIR-TRANS-1748] N84-32493
Producing thermomagnetic alloy by powder metallurgy
[BLL-M-35666-(5828.4)] N84-32500
Microstructural development and control in liquid phase sintering; processing, structures and properties of cold worked metal matrix composites
[AD-A143188] N84-32509
Processing science to increase the reliability of ceramics
[AD-A143207] N84-32539
Special features of the formation of a bed of polydispersed free-flowing materials
[BLL-M-35674-(5828.4)] N84-32747

SIZE (DIMENSIONS)
Stand-alone flat-plate photovoltaic power systems: System sizing and life-cycle costing methodology for Federal agencies
[NASA-CR-173903] N84-32922

SIZE DETERMINATION
Method for the particle size independent spectrometric determination of metal particles in lubricating oils and hydraulic fluids
[AD-D011121] N84-32445

SKIN FRICTION
The effects of porous material on microbubble skin friction reduction
[AD-A143401] N84-32756
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197995] N84-32773

SKY WAVES
Frequency correlation of HF skywave ground backscatter Doppler spectra
[PB84-204353] N84-32668
Statistics at HF skywave ground backscatter Doppler spectra
[PB84-204973] N84-32669

SLIP FLOW
Simulation of the Kelvin-Helmholtz instability of a supersonic slip surface with the Piecewise-Parabolic Method (PPM)
[DE84-013219] N84-32768

SLOT ANTENNAS
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket
[AD-A143266] N84-32653

SLOTS
Computer studies of hybrid-slotted working sections with minimum interference at subsonic speeds
[NASA-TM-86002] N84-32379
Axisymmetric thrust augmenting ejector with discrete primary air slot nozzles
[AD-D011129] N84-32366

SMOOTHING
Least-squares smoothing of direct-exchange in zonal analysis
[DE84-002612] N84-32770

SNOW
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers
[AD-A143318] N84-32655

SOBOLEV SPACE
Bounded Hessian functions N84-33048

SODIUM
Sloshing response of a reactor tank with internals
[DE84-009629] N84-32766
Solar tides in the mesospheric sodium layer
[INPE-2942-TDL/151] N84-32953

SOFTWARE ENGINEERING
Software conversion history of the Flight Dynamics System (FDS)
[NASA-CR-175257] N84-32404
Summary of research in applied mathematics, numerical analysis and computer science at the Institute for Computer Applications in Science and Engineering
[NASA-CR-172421] N84-33024
Research in computer science
[NASA-CR-173657] N84-33056
Editing by example N84-33070
Prolonging the life of software
[DE84-001722] N84-33066
S-1 software development and maintenance
[DE84-013071] N84-33091
System analysis for the Huntsville Operational Support Center distributed computer system
[NASA-CR-171136] N84-33097
NATURAL graphics N84-33274

SOFTWARE TOOLS
Software conversion history of the Flight Dynamics System (FDS)
[NASA-CR-175257] N84-32404
Programmer productivity aid catalog
[PB84-212166] N84-33095

SOILS
Photovoltaic system grounding and fault protection N84-32696

SOLAR ARRAYS
The NASA photovoltaic technology program
[NASA-TM-83665] N84-32426
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations
[NASA-CR-173918] N84-32683
Source-circuit design overview N84-32684
Hot-spot heating in central-station arrays N84-32696
Hot-spot investigations of utility scale panel configurations N84-32697
Design and selection of bypass diodes N84-32698
Electrical insulation design requirements and reliability goals N84-32691
Electrical safety for high voltage arrays N84-32697
Photovoltaic central station step and touch potential considerations in grounding system design N84-32699
Interface standardization N84-32700
Evolution of integrated panel structural design and interfaces for PV power plants N84-32701
Is structural interface standardization beneficial? N84-32702
Qualification tests and electrical measurements: Practice and problems N84-32703
Qualification and testing of modules N84-32704
Qualification testing and electrical measurement experience: A manufacturer's view N84-32705
Stand-alone flat-plate photovoltaic power systems: System sizing and life-cycle costing methodology for Federal agencies
[NASA-CR-173903] N84-32922
Concentrating photovoltaic technology
[DE84-012275] N84-32931
Particle environment — solar arrays and electric discharges
[NASA-CR-173886] N84-33210

SOLAR CELLS
Electrical insulation design requirements and reliability goals N84-32691
Hipot and continuity qualification est experience N84-32692
Breakdown of organic insulators N84-32694
Qualification and testing of modules N84-32704
Schottky barrier and homojunction gallium arsenide solar cells N84-32907
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
Influence of the interfacial layer on electrooptical properties of heterojunction solar cells
[DE84-013265] N84-32925
CdS/CuInSe2 heterojunction cell research
[DE84-004508] N84-32926
Concentrating photovoltaic technology
[DE84-012275] N84-32931
High-efficiency multi-colored photovoltaic cells
[PB84-200575] N84-32932
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173697] N84-33213

SOLAR COLLECTORS
Stable density stratification solar pond
[NASA-CASE-NPO-15419-2] N84-32910
Wind loading on solar concentrators: Some general considerations
[NASA-CR-173896] N84-32915
A nomographic methodology for use in performance trade-off studies of parabolic dish solar power modules
[NASA-CR-173908] N84-32918
Survey of manufacturers of high-performance heat engines adaptable to solar applications
[NASA-CR-173911] N84-32919
Module utilization committee
[NASA-CR-173898] N84-32920
Flate-plate photovoltaic power systems handbook for Federal agencies
[NASA-CR-173901] N84-32921
Thermal modeling of line focus photovoltaic systems
[DE84-013920] N84-32927

SOLAR DIAMETER
Solar variability observed through changes in solar figure and mean diameter
[DE84-013914] N84-33328

SOLAR ENERGY
Stable density stratification solar pond
[NASA-CASE-NPO-15419-2] N84-32910

SOLAR ENERGY CONVERSION
The NASA photovoltaic technology program
[NASA-TM-83665] N84-32426
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations
[NASA-CR-173918] N84-32683
Source-circuit design overview N84-32684

Source-circuit design with multiple photovoltaic manufacturers N84-32665
Bi-directional control system for energy flow in a solar powered flywheel
[NASA-CASE-MFS-25978-1] N84-32913
Review of solar fuel-producing quantum conversion processes
[NASA-CR-173904] N84-32916
Solar photochemical process engineering for production of fuels and chemicals
[NASA-CR-173910] N84-32917
A nomographic methodology for use in performance trade-off studies of parabolic dish solar power modules
[NASA-CR-173908] N84-32918
Survey of manufacturers of high-performance heat engines adaptable to solar applications
[NASA-CR-173911] N84-32919
Flate-plate photovoltaic power systems handbook for Federal agencies
[NASA-CR-173901] N84-32921
Proceedings of the Solar Thermal-Photochemical Conversion Workshop
[DE84-000089] N84-32929
High-efficiency multi-colored photovoltaic cells
[PB84-200575] N84-32932

SOLAR FLARES
Microwave and X-ray observations of delayed brightenings at sites remote from the primary flare locations
[NASA-TM-86140] N84-33326
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201508] N84-33329
Solar-Geophysical Data, no. 475, March 1984. Part 2: Comprehensive reports. Data for September 1983, May 1981 and miscellanea
[PB84-201516] N84-33330

SOLAR HEATING
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912

SOLAR MAGNETIC FIELD
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201508] N84-33329

SOLAR OBLATENESS
Solar variability observed through changes in solar figure and mean diameter
[DE84-013914] N84-33328

SOLAR OPTICAL TELESCOPE
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178

SOLAR PHYSICS
The effect of dimensionality on solar spectrum curves
[DE84-014136] N84-33327

SOLAR PONDS (HEAT STORAGE)
Stable density stratification solar pond
[NASA-CASE-NPO-15419-2] N84-32910

SOLAR RADIATION
The effect of dimensionality on solar spectrum curves
[DE84-014136] N84-33327

SOLAR RADIO BURSTS
Solar-Geophysical Data, no. 475, March 1984. Part 2: Comprehensive reports. Data for September 1983, May 1981 and miscellanea
[PB84-201516] N84-33330

SOLAR RADIO EMISSION
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201508] N84-33329

SOLAR REFLECTORS
Evolution of integrated panel structural design and interfaces for PV power plants N84-32701

SOLAR TERRESTRIAL INTERACTIONS
Solar tides in the mesospheric sodium layer
[INPE-2942-TDL/151] N84-32953
Solar-terrestrial data access distribution and archiving
[NASA-CR-173906] N84-33295

SOLAR WIND
A determination of the charge state of energetic magnetospheric ions by the observation of drift echoes
[AD-A143181] N84-32954
Studies of the microscale density fluctuations in the solar wind using interplanetary scintillations N84-33324

SOLAR X-RAYS
Expressions to determine temperatures and emission measures for solar X-ray events from GOES measurements
[NASA-TM-86142] N84-33325

SOLDERING
Soldering method for cable connectors
[AD-D011103] N84-32718

SOLID ELECTROLYTES
Technology Base Research Project for Electrochemical Energy Storage
[DE84-013877] N84-32930
Nuclear magnetic resonance studies of ion motion in solid electrolytes
[DE84-013846] N84-33238

SOLID LUBRICANTS
Solid lubrication design methodology
[NASA-CR-174690] N84-33309

SOLID PHASES
Liquid and solid phase compositions in a partially frozen JP-5 fuel low in n-alkanes
[AD-A143390] N84-32563

SOLID PROPELLANT COMBUSTION
Nonlinear burning stability of solid propellants
[AD-A143573] N84-32554

SOLID ROCKET PROPELLANTS
Nonlinear burning stability of solid propellants
[AD-A143573] N84-32554

SOLID SOLUTIONS
Multicomponent diffusion under general chemical potential gradients
[DE84-010630] N84-32458

SOLID STATE
Solid state tetrachloroaluminate storage battery having a transition metal chloride cathode
[AD-D011133] N84-32924

SOLID STATE DEVICES
Approximation models for electrodynamic systems in solid state millimetric wave devices N84-32606
Correlational estimation of parameters of solid state microwave devices N84-32609
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171128] N84-32949

SOLID WASTES
Workshop on Systems Analysis
[PB84-194661] N84-33136

SOLIDIFICATION
Influence of direct current on temperature gradient in directionally solidifying ingot of alloy YuNDK35T5
[BLL-M-35684-(5828.4)] N84-32495
A procedure for determining the tempo at which alloys solidify
[BLL-M-35642-(5828.4)] N84-32497
Processing and consolidation of rapidly solidified alloys: A technology assessment
[DE84-014673] N84-32523

SOLIDS
Coupling of Rayleigh-like waves with zero sound modes in normal He-3
[DE84-010519] N84-33153
X-ray spectroscopy of solids under pressure
[DE84-013790] N84-33237

SOLVENT EXTRACTION
Cleavage of aromatic carbon-carbon bonds
[DE84-010161] N84-32432
Obtaining iron-55 with high radiochemical purity
[CSIR-TRANS-1751] N84-32494

SOLVENT REFINED COAL
Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556

SONAR
Quick Deployment Vehicle (QDV)
[AD-D011060] N84-32563

SOUND PRESSURE
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32674
The prediction of acoustical particle motion using an efficient polynomial curve fit procedure
[NASA-CR-173915] N84-33145

SOUND PROPAGATION
The prediction of acoustical particle motion using an efficient polynomial curve fit procedure
[NASA-CR-173915] N84-33145

SOUND TRANSDUCERS
Development of the sonic pump levitation
[NASA-CR-161963] N84-32749

SOUND WAVES
Numerical solutions of acoustic wave propagation problems using Euler computations
[NASA-CR-172434] N84-33112
Coupling of Rayleigh-like waves with zero sound modes in normal He-3
[DE84-010519] N84-33153

SOUNDING ROCKETS
Remote data acquisition system
[AD-A143347] N84-32419
Investigation into the internal aerodynamic design and associated errors in a fast descent ducted sonde for the measurement of atmospheric pressure and temperature (AMPARS phase 2)
[AD-A143189] N84-32969

SOURCES
Source hierarchy list. Volume 1: A through H
[AD-A143500] N84-33291
Source hierarchy list. Volume 2: I through Z
[AD-A143501] N84-33292

SPACE CHARGE
A 1-dimensional disk model simulation for klystron design
[DE84-013793] N84-32727
FET charge sensor and voltage probe
[NASA-CASE-NPO-16045-1] N84-33211

SPACE ERECTABLE STRUCTURES
Foldable self-erecting joint — space erectable structures
[NASA-CASE-MSC-20635-1] N84-32424

SPACE EXPLORATION
Spinoff, 1984
[NASA-TM-86696] N84-33305
Aeronautics and space report of the President, 1983 activities
[NASA-TM-85838] N84-33364

SPACE FLIGHT
System analysis for the Huntsville Operational Support Center distributed computer system
[NASA-CR-171136] N84-33097

SPACE MISSIONS
A study of DSN traveling wave maser system reliability N84-32640
Earth orientation effects on mobile VLBI baselines N84-32642

SPACE PLATFORMS
The development of a high-capacity instrument module heat transport system, appendixes
[NASA-CR-175260] N84-32750

SPACE POWER REACTORS
Thermionic conversion reactor technology assessment
[DE84-007611] N84-33166
Space reactors: What is a kilogram?
[DE84-012656] N84-33169

SPACE PROCESSING
Development of the sonic pump levitation
[NASA-CR-161963] N84-32749

SPACE SHUTTLE MAIN ENGINE
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 6
[NASA-CR-171126] N84-32780
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171125] N84-32781
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171128] N84-32949

SPACE SHUTTLE ORBITERS
A study of leeside flow field heat transfer on Shuttle Orbiter configuration
[NASA-CR-172362] N84-32410

SPACE SHUTTLE PAYLOADS
Transient response dynamic module modifications to include static and kinetic friction effects N84-32672

SPACE SHUTTLES
Investigation of the external flow analysis for density measurements at high altitude — shuttle upper atmosphere mass spectrometer experiment
[NASA-CR-173881] N84-32352
A high energy stage for the National Space Transportation System
[NASA-TM-83795] N84-32411
Aerothermodynamic data base
[NASA-CR-171807] N84-32415
Shuttle detached spacecraft
[AD-A143320] N84-32417
Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506
Spinoff, 1984
[NASA-TM-85598] N84-33305

SPACE STATIONS
Structural performance of orthogonal tetrahedral truss Space-Station configurations
[NASA-TM-86260] N84-32422
Computer vision for real-time orbital operations. Center directors discretionary fund
[NASA-TM-86457] N84-33076

SPACE SUITS
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11534-1] N84-33021

SPACE TRANSPORTATION SYSTEM
A high energy stage for the National Space Transportation System
[NASA-TM-83795] N84-32411

SPACE TRANSPORTATION SYSTEM FLIGHTS
Columbia: The first five flights. Entry heating data series. Volume 6: The upper leeside surface centerline
[NASA-CR-171795] N84-32414

SPACEBORNE PHOTOGRAPHY
Mesoscale observations of lightning from Space Shuttle
[NASA-TM-86451] N84-32788

SPACEBORNE TELESCOPES
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control
[NASA-CR-173678] N84-33315
SPACECRAFT ANTENNAS
Potential surface improvements by bump removal for 64-m antenna N84-32627
Structural design of a vertical antenna boresight 18.3 by 18.3-m planar near-field antenna measurement system
[NASA-TM-83781] N84-32783
SPACECRAFT COMMUNICATION
Telecommunications and data acquisition support for the Pioneer Venus Project: Pioners 12 and 13, prelaunch through March 1984
[NASA-CR-173693] N84-32403
Symbol-stream combiner: Description and demonstration plans N84-32632
A strategy for successful deep space information transmission in bad weather N84-32635
Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83785] N84-32789
SPACECRAFT COMPONENTS
Flexible, resilient anti-contamination baffle
[AD-D011111] N84-32421
SPACECRAFT ELECTRONIC EQUIPMENT
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32654
SPACECRAFT LAUNCHING
A description of the ground segment of CNES, ESA, and TELESAT
[INPE-2984-NTE/211] N84-32407
SPACECRAFT MOTION
Relative motion characteristics of 2 near-Earth Satellites
[NASA-CR-173887] N84-33316
SPACECRAFT POWER SUPPLIES
Bi-directional control system for energy flow in a solar powered flywheel
[NASA-CASE-MFS-25978-1] N84-32913
Space reactors: What is a kilogram?
[DE84-012656] N84-33160
SPACECRAFT RADIATORS
Multi-leg heat pipe evaporator
[NASA-CASE-MSC-20812-1] N84-32748
The development of a high-capacity instrument module heat transport system, appendixes
[NASA-CR-175260] N84-32750
SPACECRAFT SHIELDING
Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506
Effect of alloy chemistry and exposure conditions on the oxidation of titanium
[NASA-TM-86295] N84-32507
SPACELAB
NASA Ames summary high school apprenticeship research program, 1983 research papers
[NASA-TM-85931] N84-33365
SPARK IGNITION
Engine wear with methanol fuel in a nitrogen-free environment
[AD-A143530] N84-32833
Experimental and modeling study of engine knock
[DE84-006134] N84-32644
SPATIAL RESOLUTION
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32692
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172
SPECIFIC HEAT
Determination of thermodynamic characteristics of the barium dissolution process in liquid iron
[BLL-M-35634-(5828.4)] N84-32481
SPECTRA
Optical and electrical properties of organic dye crystals
[DE84-014930] N84-33240
A study of the temporal and spectral characteristics of gamma ray bursts N84-33331
SPECTRAL BANDS
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32692
Development of a spectroradiometer with a linear network of detectors from standard CCD
[INPE-3095-TDL/165] N84-33160
SPECTRAL METHODS
The exponential accuracy of Fourier and Tchebyshev differencing methods
[NASA-CR-172495] N84-33108
The time evolution of spectral discretizations of hyperbolic systems
[NASA-CR-172432] N84-33113
SPECTRAL REFLECTANCE
Comparison of CRT (Cathode Ray Tube) antireflection filters
[PB84-202753] N84-32742
A simulation of remote sensor systems and data processing algorithms for spectral feature classification
[NASA-CR-172393] N84-32784
Development of a spectroradiometer with a linear network of detectors from standard CCD
[INPE-3095-TDL/165] N84-33160
SPECTROMETERS
Development of long wavelength semiconductor diode lasers near 26 microns for use in infrared heterodyne spectrometers
[NASA-CR-175253] N84-32602
High energy physics research at Texas Agriculture and Mining University — magnetic monopoles in cosmic rays and hadron calorimeter design
[DE84-011616] N84-33167
Modified Thomson parabola ion spectrometers for use in laser generated plasma experiments
[AD-A143298] N84-33190
SPECTROPHOTOGRAPHY
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178
SPECTRORADIOMETERS
Development of a spectroradiometer with a linear network of detectors from standard CCD
[INPE-3095-TDL/165] N84-33160
SPECTROSCOPY
Coupling of Rayleigh-like waves with zero sound modes in normal He-3
[DE84-010619] N84-33153
Gamma-ray spectroscopy of hypernuclei
[DE84-013142] N84-33162
Relation of vertical intensity profiles for neutral atom lines to analyte atomization behavior in inductively coupled plasmas
[DE84-014126] N84-33194
Optical spectroscopy of disordered materials and X-ray scattering from surfaces N84-33345
Photon correlation spectroscopy and applications N84-33352
SPECTRUM ANALYSIS
Random signal recognition based on spectral moments N84-32597
Design spectrum analysis in NASTRAN N84-32670
Rapid microbial identification by circular intensity differential scattering
[DE84-013804] N84-32993
Possible cosmological origin of the ultra high energy cosmic rays
[DE84-013063] N84-33334
SPEECH RECOGNITION
Speech communication N84-33358
Linguistics N84-33359
Communications biophysics N84-33362
SPHERICAL COORDINATES
Three-dimensional, time-dependent, compressible, turbulent, integral boundary layer equations in general curvilinear coordinates and their numerical solutions N84-32346
SPLICING
Optical fiber termination and splicing techniques
[DE84-013919] N84-32572
Low loss splicing method for single-mode optical fiber
[NASA-CASE-NPO-16294-1] N84-33179
SPLINE FUNCTIONS
Parameter estimation for the Euler-Bernoulli beam
[NASA-CR-172417] N84-33107
SPRAYERS
A theoretical and experimental study of turbulent evaporating sprays
[NASA-CR-174760] N84-32390
Warm fog dissipation using large volume water sprays
[NASA-CASE-MFS-25982-1] N84-32398
Preliminary guidelines for maintenance of polyurethane foam (PUF) roofing systems
[AD-A143458] N84-32543
SPUTTERING
RF sputtered silicon and hafnium nitrides as applied to 440C steel
[NASA-TM-86862] N84-32536
STABILITY
A study of the effects of end-cap molecular species on environmental characteristics of polimidesulfones
[NASA-TM-86283] N84-32437
A diffusion mechanism in the catalytic conversion of carbonaceous materials into diamonds at high pressures
[CSIR-TRANS-1743] N84-32536
Chemical stability of beta-aluminum
[DE84-009635] N84-32545
A two-fluid instability
[DE84-012899] N84-32764
STABILIZATION
Passive line-of-sight stabilization for an infrared sensor
[AD-A143305] N84-32792
STAINLESS STEELS
Weldability of steels: Study of cracking and methods of examination
[BLL-RISLEY-TRANS-4519-(9091.9)] N84-32475
Stress corrosion cracking of stainless steels in sea water at ambient temperature
[BLL-RISLEY-TRANS-4556-(9091.9)] N84-32476
Mechanical property data 15-5PH (H1025) stainless steel alloy: Hot-rolled plate
[AD-A143327] N84-32510
RF sputtered silicon and hafnium nitrides as applied to 440C steel
[NASA-TM-86862] N84-32536
Microstructural analysis for series 300 stainless steel sheet welds and tensile samples
[DE84-008513] N84-32837
Heat transfer, fluid flow and element vaporization in laser welding
[DE84-011783] N84-32839
Effect of surface doping on the oxidation of chromia former alloys
[DE84-013390] N84-33247
STANDARDIZATION
Source-circuit design with multiple photovoltaic manufacturers N84-32985
Interface standardization N84-32700
Is structural interface standardization beneficial? N84-32702
I/O channel interface
[NBS-FIPS-PUB-60-2] N84-33057
STAR DISTRIBUTION
Radio astronomy N84-33349
STARS
Ultraviolet interstellar absorption toward stars in the small Magellanic cloud N84-33313
STATIC CHARACTERISTICS
The development of methods to predict both the dynamic and the pseudo-static response of secondary structures subjected to seismic excitations
[DE84-010284] N84-32984
STATIC FRICTION
Transient response dynamic module modifications to include static and kinetic friction effects N84-32872
STATIC LOADS
Nonlinear elastic stability analysis of plane frames N84-32853
STATIC MODELS
Numerical calculations of the function of the static receptivity of electrons in metals
[BLL-M-35640-(5828.4)] N84-32480
STATIC TESTS
A theory of error-based testing
[AD-A143533] N84-33061
STATIC THRUST
Static thrust augmentation of rocket motors by air entrainment
[AD-A143179] N84-32430
STATISTICAL ANALYSIS
Statistics of fracture of composite materials under multiaxial loading N84-32433
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651
Numerical techniques for the prediction of flow induced orientation N84-32743
Random vibrations of multicomponent structures N84-32854
Urban scale variations of turbulence parameters and fluxes
[PB84-209113] N84-32980
Static methods in the design of nonlinear automatic control systems
[AD-A143297] N84-33101
STATISTICAL DISTRIBUTIONS
Statistics at HF skywave ground backscatter Doppler spectra
[PB84-204973] N84-32669
Distribution results for positive definite quadratic forms with repeated roots
[AD-A143450] N84-33115
Asymptotic relative efficiencies of the rank transformation procedure in randomized complete block designs
[DE84-010600] N84-33134
A methodology for the distribution of databases N84-33265

STATORS
Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine [NASA-TP-2309] N84-32368
STEADY STATE
Fast solutions to the steady state compressible and incompressible fluid dynamic equations [NASA-CR-172416] N84-32349
STEAM
Steam bottoming cycle for an adiabatic diesel engine [NASA-CR-168255] N84-33304
STEEL STRUCTURES
Structural analysis of the support system for a large compressor driven by a synchronous electric motor N84-32873
STEELS
Composition and structure of multicomponent vanadium- and niobium-base coatings [BLL-M-35657-(5828.4)] N84-32474
Generalization of results of electro-simulation of temperature of the piece during centrifugal cladding [BLL-M-35667-(5828.4)] N84-32479
Influence of microalloying with titanium and boron on cold resistance of structural steel [BLL-M-35696-(5828.4)] N84-32483
Economical grinding of steel and sintered carbides using superhard abrasives and high temperature-resistant bonds [CSIR-TRANS-1744] N84-32562
Aircraft landing dynamics facility carriage weld test program [NASA-TM-85802] N84-32827
STELLAR EVOLUTION
Some masses for population 1 and 2 cepheids [DE84-014032] N84-33311
STELLAR LUMINOSITY
Some masses for population 1 and 2 cepheids [DE84-014032] N84-33311
STELLAR MASS
Some masses for population 1 and 2 cepheids [DE84-014032] N84-33311
STELLAR MASS EJECTION
Solar-Geophysical Data, no. 475, March 1984. Part 2: Comprehensive reports. Data for September 1983, May 1981 and miscellanea [PB84-201516] N84-33330
STELLAR SPECTRA
Ultraviolet interstellar absorption toward stars in the small Magellanic cloud N84-33313
STELLAR STRUCTURE
Some masses for population 1 and 2 cepheids [DE84-014032] N84-33311
STIMULATED EMISSION
Measurement of the transverse mode excitation in the stimulated emission of the ACO free electron laser [AD-A143449] N84-32808
STIRLING CYCLE
SEAMOPT: Sterling engine optimization code [DE84-012096] N84-32840
Automotive Stirling Engine Development Program. RESD summary report [NASA-CR-174674] N84-33307
STOCHASTIC PROCESSES
TP2 orderings [AD-A143434] N84-33132
STONY METEORITES
Model for GCR-particle fluxes in stony meteorites and production rates of cosmogenic nuclides [NASA-CR-173923] N84-33321
STORAGE BATTERIES
Solid state tetrachloroaluminate storage battery having a transition metal chloride cathode [AD-D011133] N84-32924
STORM DAMAGE
Hurricane Alicia: Prediction, damage and recovery efforts [GPO-33-446] N84-32968
STRAIN GAGES
Three-wire static strain gage apparatus [AD-D011130] N84-32776
STRAIN RATE
Processing science to increase the reliability of ceramics [AD-A143207] N84-32539
Optimal measurement of ice-sheet deformation from surface-marker arrays [NASA-CR-173877] N84-32950
Development of the model 52500 strain-inertial seismometer system (prototype) [AD-A143572] N84-32961
STRATIGRAPHY
Stratigraphy and sedimentology of the upper Proterozoic Kingston Peak Formation, Panamint Range, eastern California N84-32939
Computer calculated analysis of subsurface formation porosities in central New York state N84-32941
Lower tertiary biostratigraphy and paleoecology of the Quilcene-Discovery Bay area, northeast Olympic Peninsula, Washington N84-32943
Morphologic studies of the Moon and planets [NASA-CR-173866] N84-33319
STRATOSPHERE
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 28 km [NASA-CR-173879] N84-32951
Proceedings of a Workshop on Polar Stratospheric Clouds: Their Role in Atmospheric Processes [NASA-CP-2318] N84-32952
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers [AD-A143319] N84-32959
STREAMS
Topographic effects of the Alaskan stream on shelf currents [PB84-206137] N84-32968
STRESS (PHYSIOLOGY)
Correlation between plasma fibronectin level and mortality following experimental rate heat stress [AD-A143363] N84-32991
STRESS ANALYSIS
A simple rectangular element for 2-dimensional analysis of laminated composites [NASA-TM-86291] N84-32439
Creep transitions in aluminum solid-solution alloys N84-32472
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857
STRESS CONCENTRATION
Hole interaction and load introduction effects for compression-loaded laminates with holes [NASA-TM-86287] N84-32435
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue [NASA-CR-174666] N84-32503
Stresses and displacements in linear Maxwell non-isothermal circular plates on Winkler foundation and with radial and transverse variation in material properties N84-32856
Systematic jointing in the cardium sandstone along the Bow River, Alberta, Canada N84-32937
STRESS CORROSION CRACKING
Stress corrosion cracking of stainless steels in sea water at ambient temperature [BLL-RISLEY-TRANS-4556-(9091.9)] N84-32476
Chromium-magnesium stainless steels, resistant to stress corrosion cracking in magnesium and calcium chloride solutions [BLL-RISLEY-TRANS-4571-(9091.9)] N84-32477
Stress corrosion cracking of austenitic stainless steels in sea water: An investigation of test methods [BLL-RISLEY-TRANS-4568-(9091.9)] N84-32478
STRESS INTENSITY FACTORS
Crack problems for bonded nonhomogeneous materials under antiplane shear loading [NASA-CR-173892] N84-32863
STRESS WAVES
Detection of damage in hydraulic components by acoustic emission techniques [AD-A143262] N84-32650
STRESS-STRAIN RELATIONSHIPS
Free bulging of round diaphragm exposed to uniform pressure in state of creep [BLL-M-35660-(5828.4)] N84-32861
STRESSES
Loss factors measured in metal matrix composite materials [AD-A143542] N84-32440
STRUCTURAL ANALYSIS
Hygrothermal effects on mechanical behavior of graphite/epoxy laminates beyond initial failure [NASA-TM-86001] N84-32438
A simple rectangular element for 2-dimensional analysis of laminated composites [NASA-TM-86291] N84-32439
Creep transitions in aluminum solid-solution alloys N84-32472
Modeling of concrete response at high temperature [DE84-009587] N84-32570
Development of shearography for nondestructive testing of highway structure [PB84-187244] N84-32577
Time-to-corrosion of reinforcing steel in concrete slabs. Volume 5: Calcium nitrite admixture or epoxy-coated reinforcing bars as corrosion protection systems [PB84-195239] N84-32578
NASTRAN structural model for the large 64-meter antenna pedestal. Part 3: Applications to hydrostatic bearing oil film N84-32638
Microstructural analysis for series 300 stainless steel sheet welds and tensile samples [DE84-008513] N84-32837
Nonlinear elastic stability analysis of plane frames N84-32853
Twelfth NASTRAN Users' Colloquium [NASA-CP-2328] N84-32864
Computer aided modeling and post processing with NASTRAN analysis N84-32869
Design spectrum analysis in NASTRAN N84-32870
Seismic analysis capability in NASTRAN N84-32871
Transient response dynamic module modifications to include static and kinetic friction effects N84-32872
Structural analysis of the support system for a large compressor driven by a synchronous electric motor N84-32873
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32875
Four new capabilities in NASTRAN for dynamic and aeroelastic analyses of rotating cyclic structures N84-32876
Fatigue behavior of longitudinal transverse stiffener intersection [PB84-202092] N84-32887
Parameter estimation for the Euler-Bernoulli beam [NASA-CR-172417] N84-33107
Theory of the electronic properties of mercury-cadmium-telluride alloys [AD-A143426] N84-33221
STRUCTURAL BASINS
Morphologic studies of the Moon and planets [NASA-CR-173866] N84-33319
STRUCTURAL DESIGN
A description of the ground segment of CNES, ESA, and TELESAT [INPE-2984-NTE/211] N84-32407
A nomographic methodology for use in performance trade-off studies of parabolic dish solar power modules [NASA-CR-173908] N84-32918
Thermionic conversion reactor technology assessment [DE84-007611] N84-33168
STRUCTURAL DESIGN CRITERIA
Structural design of a vertical antenna boresight 18.3 by 18.3-m planar near-field antenna measurement system [NASA-TM-83781] N84-32783
STRUCTURAL ENGINEERING
Computer aided modeling and post processing with NASTRAN analysis N84-32869
STRUCTURAL FAILURE
Validation of an Active Gear, Flexible Aircraft Take-off and Landing analysis (AGFATL) [NASA-TP-2353] N84-32378
Failure prediction of notched pressure vessels using the CTOD approach [DE84-013057] N84-32883
STRUCTURAL MEMBERS
Structural performance of orthogonal tetrahedral truss Space-Station configurations [NASA-TM-86260] N84-32422
Development of shearography for nondestructive testing of highway structure [PB84-187244] N84-32577
Fatigue behavior of longitudinal transverse stiffener intersection [PB84-202092] N84-32887
STRUCTURAL PROPERTIES (GEOLOGY)
The petrology, structure and geochemistry of an Archean terrane in the North Snowy Block, Beartooth Mountains, Montana N84-32940
Computer calculated analysis of subsurface formation porosities in central New York state N84-32941
STRUCTURAL VIBRATION
Random vibrations of multicomponent structures N84-32854
Structural analysis of the support system for a large compressor driven by a synchronous electric motor N84-32873
Analysis of parametrically excited large vibration systems [AD-A143283] N84-32879
STRUCTURAL WEIGHT
Optimization of antenna structure design N84-32624
STUDENTS
NASA Ames summary high school apprenticeship research program, 1983 research papers [NASA-TM-85931] N84-33365
STYRENES
The transformation of liquid to amorphous solid: The time to vitrify for styrene polymerization [AD-A143228] N84-32452
Stabilized unsaturated polyesters [NASA-CASE-NPO-16103-1] N84-32530

SUBGROUPS
Subgroups of continuous groups acting differentiably on the half-line N84-33028
SUBMARINES
Around-a-mast quadrifilar microstrip antenna
[AD-D011051] N84-32617
SUBMILLIMETER WAVES
Submillimeter, millimeter, and microwave spectral line catalogue
[NASA-CR-173899] N84-32448
SUBREFLECTORS
The 64-m antenna automatic subreflector focusing controller N84-32628
Intermodulation product levels in flame-sprayed materials N84-32629
SUBSONIC FLOW
Report of tests of a compressor configuration of CD (Controlled Diffusion) blading
[AD-A143499] N84-32832
SUBSTITUTES
Protected ethynylated phenols
[AD-D011096] N84-32544
SUBSTRATES
A high-performance hybrid RF isolation amplifier N84-32623
Schottky barrier and homojunction gallium arsenide solar cells N84-32907
SUCTION
Supersonic flows around a circular cone with or without blowing on the surface
[AD-A143258] N84-32362
SUDDEN IONOSPHERIC DISTURBANCES
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201506] N84-33329
SULFIDES
Lithium-alloy/metal sulfide battery research
[DE84-013427] N84-32720
Thermal management of a lithium/iron-sulfide battery
[DE84-013438] N84-32722
Electrochemical performance of porous nickel sulfide electrodes
[DE84-009586] N84-32741
SULFONES
A study of the effects of end-cap molecular species on environmental characteristics of polimidesulfones
[NASA-TM-86283] N84-32437
SUN
Expressions to determine temperatures and emission measures for solar X-ray events from GOES measurements
[NASA-TM-86142] N84-33325
Solar variability observed through changes in solar figure and mean diameter
[DE84-013914] N84-33326
SUNSPOTS
Solar-Geophysical Data, no. 475, March 1984. Part 1: Prompt reports. Data for September 1983, May 1981
[PB84-201506] N84-33329
Solar-Geophysical Data, no. 475, March 1984. Part 2: Comprehensive reports. Data for September 1983, May 1981 and miscellanea
[PB84-201516] N84-33330
SUPERCONDUCTING MAGNETS
Method and apparatus for making superconductive magnet coils
[DE84-014510] N84-32737
SUPERCONDUCTIVITY
Anomalous surface impedance in reentrant ferromagnetic superconductors
[DE84-012634] N84-33230
Dynamics of normal-zone propagation in Ta at small currents
[DE84-009990] N84-33245
SUPERCONDUCTORS
Superconductive films in microwave microelectronics (survey) N84-32604
Present status and probable future capabilities of heavy-ion linear accelerators
[DE84-011741] N84-33158
The proximity effects of superconducting multilayer film
[AD-A143255] N84-33217
Studies of structural properties and their relationship to critical parameters in superconducting materials
[AD-A143556] N84-33227
Anomalous surface impedance in reentrant ferromagnetic superconductors
[DE84-012634] N84-33230
Dynamics of normal-zone propagation in Ta at small currents
[DE84-009990] N84-33245
SUPERCRITICAL FLOW
Developing turbulent flow in a 180(0) curved pipe and its downstream tangent
[DE84-013991] N84-32767
SUPERCRITICAL WINGS
Subsonic and transonic unsteady- and steady-pressure measurements on a rectangular supercritical wing oscillated in pitch — wind tunnel tests
[NASA-TM-85765] N84-32348
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353
SUPERFLUIDITY
Maximum supercooling in liquid 3He-4He mixtures near the tricritical point
[DE84-010076] N84-33232
Period-doubling 2-torus state in a convecting He-3-superfluid He-4 solution
[DE84-009985] N84-33243
Onset of oscillations in symmetric convective states in a superfluid He-3-He-4 mixture
[DE84-009984] N84-33244
SUPERSONIC FLOW
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC)
[AD-A143253] N84-32360
Supersonic flows around a circular cone with or without blowing on the surface
[AD-A143258] N84-32362
Simulation of the Kelvin-Helmholtz instability of a supersonic slip surface with the Piecewise-Parabolic Method (PPM)
[DE84-013219] N84-32768
SUPERSONIC JET FLOW
Dynamics of large molecules and molecular clusters
[AD-A143386] N84-32542
SUPPORTS
Structural analysis of the support system for a large compressor driven by a synchronous electric motor N84-32873
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32875
The development of methods to predict both the dynamic and the pseudo-static response of secondary structures subjected to seismic excitations
[DE84-010284] N84-32884
SURFACE ACOUSTIC WAVE DEVICES
Non-destructive testing of semiconductors using surface acoustic wave
[AD-A143559] N84-33228
SURFACE FINISHING
Features of behaviour of gas bubbles in molten oxide films during enamelling
[BLL-M-35672-(5828.4)] N84-32496
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535
SURFACE NAVIGATION
Direct measurement of Earth's vertical deflection using global positioning system
[AD-D011099] N84-32373
SURFACE PROPERTIES
Low temperature epitaxial deposition of silicon by plasma enhanced CVD (Chemical Vapor Deposition)
[AD-A143208] N84-33216
Diamond surface: Atomic and electronic structure
[DE84-013518] N84-33234
Optical spectroscopy of disordered materials and X-ray scattering from surfaces N84-33345
SURFACE REACTIONS
The chemical and physical changes on lubricated surfaces N84-32820
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192
Synergistic effects in plasma surface interactions
[DE84-012346] N84-33199
Formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules
[AD-A143552] N84-33226
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246
Semiconductor surface studies N84-33338
Chemical reaction dynamics at surfaces N84-33340
SURFACE ROUGHNESS
Mechanical interactions of rough surfaces
[DE84-014097] N84-32841
The role of the reflection coefficient in precision measurement of ultrasonic attenuation
[NASA-TM-83786] N84-32849
SURFACE TEMPERATURE
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage
[DE84-012234] N84-32796
Determination of sea surface temperature with N-ROSS (Navy-Remote Ocean Sensing System)
[AD-A143563] N84-32984
SURFACTANTS
Optical spectroscopy of disordered materials and X-ray scattering from surfaces N84-33345
SURVEILLANCE
The feasibility, practicality and utility of P-3 inflight refueling
[AD-A143419] N84-32382
SURVEYS
Survey of manufacturers of high-performance heat engines adaptable to solar applications
[NASA-CR-173911] N84-32919
Predictions of satisfaction with automated library circulation systems N84-33259
SWELLING
Fundamental alloy studies
[DE84-013941] N84-32513
SWEPT WINGS
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC)
[AD-A143253] N84-32360
SWEPTBACK WINGS
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353
SWITCHES
The 20 x 20 high speed microwave switches
[NASA-TM-83775] N84-32644
Magnetic switches and circuits, revision 2
[DE84-014141] N84-32725
Large aperture electro-optical switch
[DE84-013089] N84-32728
SWITCHING
Three-wire static strain gage apparatus
[AD-D011130] N84-32776
SWITCHING CIRCUITS
Electronic Switching Spherical Array (ESSA) antenna systems
[NASA-TM-86127] N84-32621
Radio frequency distribution assembly
[AD-A143575] N84-32658
SYMMETRY
Infinitesmal deformation of locally symmetrical Riemann spaces. 2: Blaschke's infinitesimal conjecture for complex projective space N84-33049
Inelastic strong interactions at high energies
[DE84-013647] N84-33170
SYNCHRONISM
Digital multi-tapped delay line with automatic time-domain programming
[AD-D011136] N84-32676
SYNCHRONOUS METEOROLOGICAL SATELLITE
The severity of the Brazilian freeze of 1981 as monitored in real time by satellite
[INPE-2586-PRE/234] N84-32967
SYNTAX
Linguistics N84-33359
SYNTHESIS (CHEMISTRY)
Synthesis and characterization of phosphorus-containing polyamides and copolyamides based on 1methyl}-2,4- and -2,6-diaminobenzenes
[NASA-TM-85877] N84-32431
A study of the effects of end-cap molecular species on environmental characteristics of polimidesulfones
[NASA-TM-86283] N84-32437
Method for forming fibrous silicon carbide insulating material
[DE84-014658] N84-32442
A study of Beta-hydroxyamines and Beta-hydroxysulphides as corrosion inhibitors for metals
[BLL-T6313/BG/WH773/84] N84-32487
Diamond synthesis from various graphites
[CSIR-TRANS-1749] N84-32528
Protected ethynylated phenols
[AD-D011096] N84-32544
EPR investigation of inclusions in cubic boron nitride crystals
[CSIR-TRANS-1752] N84-33207
New materials from high temperature synthesis
[DE84-014125] N84-33231
SYNTHETIC APERTURE RADAR
Development and characterization analysis of a radar polarimeter
[NASA-CR-175259] N84-32785
Development of color criteria for advanced displays
[AD-A143246] N84-33008
SYNTHETIC APERTURES
Synthesis of antennas with weak superdirectivity N84-32581
SYNTHETIC RESINS
Electrically conducting poly(vinyl acetate)
[AD-A143199] N84-32538
SYNTHETIC RUBBERS
Physical techniques for profiling heterogeneous polymer degradation
[DE84-013807] N84-32547

SYSTEM EFFECTIVENESS
Conceptual design of a noncontacting power transfer device for the ASPS Vernier system
[NASA-CR-172238] N84-32677
Review of flow battery testing at Sandia
[DE84-011186] N84-32734
Solar photochemical process engineering for production of fuels and chemicals
[NASA-CR-173910] N84-32917
Design, test, and evaluation of an Air Force environmental model and data exchange
[AD-A143226] N84-33060
SYSTEM FAILURES
Availability of the DSN telemetry data system and its major elements, including the TWM assemblies N84-32639
SYSTEMS ANALYSIS
Microcomputers in transportation: Software and source book
[PB84-195155] N84-33067
System analysis for the Huntsville Operational Support Center distributed computer system
[NASA-CR-171136] N84-33097
Workshop on Systems Analysis
[PB84-194661] N84-33138
Predictions of satisfaction with automated library circulation systems N84-33259
SYSTEMS ENGINEERING
A system for controlling the oxygen content of a gas produced by combustion
[NASA-CASE-LAR-13257-1] N84-32447
Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 1: Executive summary
[NASA-CR-175261] N84-32646
Microcomputers in transportation: Software and source book
[PB84-195155] N84-33067
Implementing automated information systems in the Air Force
[AD-A143398] N84-33288
SYSTEMS INTEGRATION
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 3: Performance and simulation
[NASA-CR-175263] N84-32648
Interactive information environments: A plan for enabling interdisciplinary research
[RAND/N-2115] N84-33284

T

TACAN
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372
TACKINESS
Structural pressure sensitive silicone adhesives
[NASA-CASE-LAR-13270-1] N84-32532
TAKEOFF
Validation of an Active Gear, Flexible Aircraft Take-off and Landing analysis (AGFATL)
[NASA-TP-2353] N84-32378
TARGET ACQUISITION
Sensor correlation and data fusion theory
[AD-A143587] N84-33133
Target for optically activated seekers and trackers
[AD-D011059] N84-33171
TARGET RECOGNITION
Sensor correlation and data fusion theory
[AD-A143587] N84-33133
TDR SATELLITES
Electronic Switching Spherical Array (ESSA) antenna systems
[NASA-TM-86127] N84-32621
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 2: Design and development
[NASA-CR-175262] N84-32647
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 4: Functional specification for the prototype Automated Integrated Receive System (AIRS)
[NASA-CR-175264] N84-32649
TEA LASERS
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32806
TEARING MODES (PLASMAS)
Reliability of initial-value MHD calculations of Tokamak disruptions
[DE84-013600] N84-33193
TECHNOLOGICAL FORECASTING
Future requirements for airborne simulation
[AGARD-AR-188] N84-32401
Impact of robots and computers on the work force of the 1980's
[GPO-31-912] N84-32826
National Aeronautics and Space Administration Authorization Act, 1985
[PUB-LAW-98-361] N84-33303
TECHNOLOGY ASSESSMENT
The NASA photovoltaic technology program
[NASA-TM-83885] N84-32426
Metal coating of diamond abrasives (review of foreign patents)
[CSIR-TRANS-1740] N84-32489
Pastes of superhard materials (review of inventions)
[CSIR-TRANS-1741] N84-32491
Processing and consolidation of rapidly solidified alloys: A technology assessment
[DE84-014673] N84-32523
Coatings on diamond and CBN abrasives (review of inventions)
[CSIR-TRANS-1742] N84-32525
Superfluid helium 2 liquid-vapor phase separation: Technology assessment
[NASA-TM-85966] N84-32752
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1
[AD-A143248] N84-32830
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents. Appendix
[PB84-196997] N84-33255
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents
[PB84-197003] N84-33256
TECHNOLOGY TRANSFER
Technology Base Research Project for Electrochemical Energy Storage
[DE84-013877] N84-32930
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents. Appendix
[PB84-196997] N84-33255
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents
[PB84-197003] N84-33256
Interactive information environments: A plan for enabling interdisciplinary research
[RAND/N-2115] N84-33284
Scientific and technical information transfer: Issues and options
[RAND/N-2131-NSF] N84-33286
European scientific notes, Volume 38, Number 7
[AD-A143238] N84-33287
TECHNOLOGY UTILIZATION
Design and selection of bypass diodes N84-32688
A user view of office automation or the integrated workstation N84-33271
TECTONICS
Systematic jointing in the cardium sandstone along the Bow River, Alberta, Canada N84-32937
Stratigraphy and sedimentology of the upper Proterozoic Kingston Peak Formation, Panamint Range, eastern California N84-32939
TELECOMMUNICATION
A description of the ground segment of CNES, ESA, and TELESAT
[INPE-2984-NTE/211] N84-32407
Random multiple access methods in multi-user communication systems N84-32616
The Telecommunications and Data Acquisition Report
[NASA-CR-173885] N84-32622
TELEMETRY
Telecommunications and data acquisition support for the Pioneer Venus Project: Pioners 12 and 13, prelaunch through March 1984
[NASA-CR-173893] N84-32403
Design of a digital telemetry data collection system
[DE84-013916] N84-32420
Availability of the DSN telemetry data system and its major elements, including the TWM assemblies N84-32639
DCP systems and characteristics
[INPE-2948-PRE/431] N84-32899
TELEOPERATORS
Teleoperator human factors study
[NASA-CR-173890] N84-33022
TELEVISION SYSTEMS
Evaluation of the limiting accuracy in determining the coordinates of a point light source by a television tracking system using an image dissector with the presence of a nonstationary current component N84-32613
A transportable satellite Earth station
[BBC-RD-1984/8] N84-32614
Video noise reduction
[BBC-RD-1984/7] N84-32615
TELLURIUM ALLOYS
Theory of the electronic properties of mercury-cadmium-telluride alloys
[AD-A143429] N84-33221
TEMPERATURE
Studies in climate
[PB84-196385] N84-32977
TEMPERATURE CONTROL
Thermal management of a lithium/iron-sulfide battery
[DE84-013438] N84-32722
General energy balance for battery systems
[DE84-013235] N84-32731
The development of a high-capacity instrument module heat transport system, appendixes
[NASA-CR-175260] N84-32750
Temperature controlled gyro
[AD-D011138] N84-32777
Variable gain oven temperature control circuit
[AD-D011141] N84-32778
TEMPERATURE DEPENDENCE
Loss factors measured in metal matrix composite materials
[AD-A143542] N84-32440
Pressure-dependent resistive behavior of YbBe13
[DE84-010068] N84-32514
Development and testing of glass coatings for Hexanite-A powders
[CSIR-TRANS-1747] N84-32527
Chemical reactions, radiative and energy transfer processes of important atmospheric species
[AD-A143264] N84-33158
Studies of structural properties and their relationship to critical parameters in superconducting materials
[AD-A143556] N84-33227
TEMPERATURE DISTRIBUTION
A study of heat release rate distribution in a gas turbine combustor by acoustic measurements N84-32365
A study of leeside flow field heat transfer on Shuttle Orbiter configuration
[NASA-CR-172362] N84-32410
Thermal management of a lithium/iron-sulfide battery
[DE84-013438] N84-32722
General energy balance for battery systems
[DE84-013235] N84-32731
Heat transfer, fluid flow and element vaporization in laser welding
[DE84-011783] N84-32839
Horizontal cylindrical vessels supported by saddles subjected to vertical and lateral force fields N84-32858
Thermal shock: High temperature high energy rate testing
[DE84-014147] N84-32886
TEMPERATURE EFFECTS
Low temperature evaluation of advanced technology hydraulic system (8,000 psi)
[AD-A143389] N84-32396
Association and bound motion in alkali metal doped cadmium fluoride
[AD-A143200] N84-32450
Effect of thermal aging on the output of a pyrotechnic actuator
[DE84-012903] N84-32558
Hot-spot investigations of utility scale panel configurations N84-32687
Stresses and displacements in linear Maxwell non-isothermal circular plates on Winkler foundation and with radial and transverse variation in material properties N84-32856
Correlation between plasma fibronectin level and mortality following experimental rate heat stress
[AD-A143383] N84-32991
Liquified natural gas densities: Summary of research program at the National Bureau of Standards
[PB84-202647] N84-33297
TEMPERATURE GRADIENTS
Generalization of results of electro-simulation of temperature of the piece during centrifugal cladding
[BLL-M-35687-(5828.4)] N84-32479
Influence of microalloying with titanium and boron on cold resistance of structural steel
[BLL-M-35686-(5828.4)] N84-32483
Influence of direct current on temperature gradient in directionally solidifying ingot of alloy YuNDK35T5
[BLL-M-35684-(5828.4)] N84-32495
A procedure for determining the tempo at which alloys solidify
[BLL-M-35642-(5828.4)] N84-32497

Manipulation of the mixing process between streams of different velocity and temperature in the presence of pressure gradient
[AD-A143467] N84-32757

TEMPERATURE MEASUREMENT
The Record of Electrical and Communication Engineering Conversazione, volume 53, no. 1, Jul. 1984
[ISSN-0385-7719] N84-32565
A study on accurate frequency-control of semiconductor lasers N84-32566
Thermoscopic study of diffraction current distribution N84-32583
Hydrographic measurements in the western Arboran Sea, October 1982
[AD-A143586] N84-32985

TEMPERATURE MEASURING INSTRUMENTS
Three-wire static strain gage apparatus
[AD-D011130] N84-32776

TEMPERATURE PROFILES
High efficiency heat pump using ground heat source
[DE84-006385] N84-32761
Hydrographic measurements in the western Arboran Sea, October 1982
[AD-A143586] N84-32985

TEMPERATURE SENSORS
Temperature controlled gyro
[AD-D011138] N84-32777

TEMPERING
Aircraft landing dynamics facility carriage weld test program
[NASA-TM-85802] N84-32827

TEMPLATES
New machines for grinding, facetting and profiling hard materials
[CSIR-TRANS-1750] N84-32821

TEMPORAL RESOLUTION
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172

TENSILE STRENGTH
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner
[NASA-CR-174691] N84-32504
Microstructural development and control in liquid phase sintering; processing, structures and properties of cold worked metal matrix composites
[AD-A143186] N84-32509
Simple examples of non linear truss behavior
[AD-A143368] N84-32862

TENSILE STRESS
Failure analysis of a graphite/epoxy laminate subjected to bolt bearing loads
[NASA-TM-86297] N84-32436

TENSORS
Use of the tensor product for numerical weather prediction by the finite element method, part 1
[AD-A143273] N84-32970

TERNARY ALLOYS
Fundamental alloy studies
[DE84-013941] N84-32513

TERNARY SYSTEMS
Preparation of high purity Ga(X)In(1-x) by the VPE-hydride method with a gallium-indium alloy source
[AD-A143275] N84-33218
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors
[AD-A143551] N84-33225
Studies of structural properties and their relationship to critical parameters in superconducting materials
[AD-A143556] N84-33227

TERRAIN
Experimental and model transport and diffusion studies in complex terrain with emphasis on tracer studies
[DE84-013076] N84-32975

TERRESTRIAL RADIATION
Science support for the Earth radiation budget sensor on the Nimbus-7 spacecraft
[NASA-CR-175251] N84-32948

TEST FACILITIES
The need for biaxial fatigue testing at A.R.L.
[AD-A143203] N84-32878

TEST STANDS
Construction and evaluation of a flow test stand
[PB84-201581] N84-32906

TETHYS
A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

TEXAS
Investigation of several aspects of LANDSAT 4/5 data quality — California, Texas, Arkansas, Alabama, and Pacific Ocean
[E84-10024] N84-32892

TEXTILES
Textile ballistic performance (data base)
[AD-A143249] N84-32541

THEMATIC MAPPING
Mapping magnetized geologic structures from space: The effect of orbital and body parameters
[E84-10191] N84-32895

THEOREM PROVING
An application of fine potential theory to prove a Phragmen Lindeloef theorem N84-33043

THEOREMS
Fatou theorem for the proper functions of invariant potential operators by a group of Cartan displacements N84-33037
Deduction in nonhorn databases N84-33263

THERMAL ANALYSIS
Thermal analysis of a planetary transmission with spherical roller bearings operating after complete loss of oil
[NASA-TP-2367] N84-32824
Thermal modeling of line focus photovoltaic systems
[DE84-013920] N84-32927

THERMAL BATTERIES
Solid state tetrachloroaluminate storage battery having a transition metal chloride cathode
[AD-D011133] N84-32924

THERMAL CONDUCTIVITY
Investigation of the state of materials in plasma deposition of refractory coatings
[BLL-M-35686-(5828.4)] N84-32485
Thermal management of a lithium/iron-sulfide battery
[DE84-013436] N84-32722
Calculation of thermal stress state for components of metallurgical equipment by electric simulation
[BLL-M-35690-(5828.4)] N84-32660

THERMAL DEGRADATION
Basic problems in InP technology
[AD-A143456] N84-33222

THERMAL DIFFUSION
Multicomponent diffusion under general chemical potential gradients
[DE84-010830] N84-32458

THERMAL EXPANSION
Forecasting of high voltage insulation performance: Testing of recommended potting materials and of capacitors
[NASA-TM-85536] N84-32681
Replication of high power laser mirrors
[AD-D011140] N84-33177

THERMAL INSTABILITY
Thermally induced instabilities of two-layer fluid systems N84-32745

THERMAL INSULATION
Method for forming fibrous silicon carbide insulating material
[DE84-014658] N84-32442
Development of advanced thermal insulation for appliances
[DE84-013132] N84-32763

THERMAL PROTECTION
Low cost thermal protection system processing
[AD-D011142] N84-32434
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control
[NASA-CR-173678] N84-33315

THERMAL RESISTANCE
Resistance of microorganisms from mesosphere to periodic freezing-thawing N84-33001

THERMAL SHOCK
Thermal shock: High temperature high energy rate testing
[DE84-014147] N84-32886

THERMAL STABILITY
Synthesis and characterization of phosphorus-containing polyamides and copolyamides based on 1methyl)-2,4- and -2,6-diaminobenzenes
[NASA-TM-85877] N84-32431
Stabilized unsaturated polyesters
[NASA-CASE-NPO-16103-1] N84-32530
Investigation of thermal stability of fluorinol-85 and 2-methylpyridine-water as Rankine cycle power system working fluids
[DE84-006420] N84-32559
Variable gain oven temperature control circuit
[AD-D011141] N84-32778
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013861] N84-33196

THERMAL STRESSES
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door
[NASA-CR-171732] N84-32416
Calculation of thermal stress state for components of metallurgical equipment by electric simulation
[BLL-M-35690-(5828.4)] N84-32660

THERMIONIC CONVERTERS
Thermionic conversion reactor technology assessment
[DE84-007611] N84-33168

THERMOCHEMICAL PROPERTIES
A study of the effects of end-cap molecular species on environmental characteristics of polimidesulfones
[NASA-TM-86283] N84-32437
Chemistry of energetic fragments: Hypovalent radicals
[AD-A143269] N84-32483

THERMODYNAMIC PROPERTIES
Determination of thermodynamic characteristics of the barium dissolution process in liquid iron
[BLL-M-35634-(5828.4)] N84-32481
Properties of UV-cursible polyurethane acrylates: Effect of reactive diluent
[AD-A143241] N84-32540
Nonlinear burning stability of solid propellants
[AD-A143573] N84-32554
Materials testing of the IUS techroll seal material
[NASA-TM-86462] N84-32829

THERMODYNAMICS
A study of heat release rate distribution in a gas turbine combustor by acoustic measurements N84-32385
Heat-of-mixing experiments for liquefied gases
[PB84-215094] N84-32560

THERMOLUMINESCENCE
Recent developments in thermoluminescence kinetics
[DE84-013226] N84-32457

THERMOMAGNETIC EFFECTS
Producing thermomagnetic alloy by powder metallurgy
[BLL-M-35688-(5828.4)] N84-32500
Thermomagnetic properties of GdPd
[DE84-009991] N84-32515

THERMONUCLEAR REACTIONS
Plasma dynamics N84-33354

THERMOREGULATION
Mechanisms of thermoregulation of rats exposed to hypergravic fields N84-32869

THERMOSPHERE
Dynamic model of the Earth's upper atmosphere
[NASA-CR-3835] N84-32965

THIN FILMS
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage
[DE84-012234] N84-32798
The chemical and physical changes on lubricated surfaces N84-32820
CdS/CuInSe2 heterojunction cell research
[DE84-004508] N84-32926
The proximity effects of superconducting multilayer film
[AD-A143255] N84-33217
Electron localization and superconductivity of very thin epitaxially grown ag films on ge(001)
[AD-A143469] N84-33224
Mechanisms involved in the glow-discharge deposition of doped hydrogenated amorphous silicon
[DE84-013124] N84-33236
Local electronic properties of semiconductor surfaces and interfaces
[DE84-013606] N84-33239

THIN PLATES
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857

THREE BODY PROBLEM
Intermediate-energy nuclear theory — nucleon-nucleon theory, three-dadron systems, hadron form factors, and Dirac particles
[DE84-012971] N84-33161

THREE DIMENSIONAL FLOW
Analysis of three-dimensional transonic compressors
[NASA-CR-166580] N84-32356
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760

THRESHOLDS
Estimation of sensitivity threshold in integrating analog-to-digital converters with averaging of readings N84-32593

THRUST AUGMENTATION
Axisymmetric thrust augmenting ejector with discrete primary air slot nozzles
[AD-D011129] N84-32366
Static thrust augmentation of rocket motors by air entrainment
[AD-A143179] N84-32430

THRUST REVERSAL
Thrust Reverser/Exhaust nozzle assembly for a gas turbine engine
[AD-D011101] N84-32392

THUNDERSTORMS
Lightning swept-stroke attachment patterns and flight conditions for storm hazards 1981
[NASA-TM-86279] N84-32365

Thunderstorm impact on Denver air traffic control operations and the role of NEXRAD (Next Generation Weather Radar)
[PB84-169729] N84-32374

THYRATRONS
Evaluation of bidirectionally conducting thyratrons for pulsed excimer lasers
[DE84-013890] N84-32818

THYRISTORS
High-speed thyristors on weakly doped GaAs
N84-32600

TIDES
Solar tides in the mesospheric sodium layer
[INPE-2942-TDL/151] N84-32953

TIME
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers
[AD-A143318] N84-32655

TIME DEPENDENCE
Three-dimensional, time-dependent, compressible, turbulent, integral boundary layer equations in general curvilinear coordinates and their numerical solutions
N84-32346
Fast solutions to the steady state compressible and incompressible fluid dynamic equations
[NASA-CR-172416] N84-32349
Effects of standtime on the available capacity of lead-acid and nickel/iron electric vehicle batteries
[DE84-013452] N84-32721
Time development of Cerenkov radiation
[AD-A143225] N84-33155
Drift mobilities by time-of-flight methods and time-dependent phototransport in the nanosecond regime in amorphous semiconductors
[DE84-014906] N84-33241
Onset of oscillations in symmetric convective states in a superfluid He-3-He-4 mixture
[DE84-009984] N84-33244

TIME MEASUREMENT
Synchronization tracking in pulse position modulation receiver
[NASA-CASE-NPO-16256-1] N84-32620
Programmable signal processing device
[AD-D011109] N84-32673
Volumetric fuel quantity gauge
[NASA-CASE-LAR-13147-1] N84-32787

TIME OF FLIGHT SPECTROMETERS
Drift mobilities by time-of-flight methods and time-dependent phototransport in the nanosecond regime in amorphous semiconductors
[DE84-014906] N84-33241

TIME SERIES ANALYSIS
Assessment of trends of input actions of inertial objects
[BLL-M-35689-(5828.4)] N84-33104

TIME SIGNALS
Simultaneous detection of time coincident signals in an adaptive Doppler tracker
[AD-D011092] N84-32659

TIME TEMPERATURE PARAMETER
The transformation of liquid to amorphous solid: The time to vitrify for styrene polymerization
[AD-A143228] N84-32452

TIN TELLURIDES
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors
[INPE-3045-TDL/157] N84-33212

TIP DRIVEN ROTORS
Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine
[NASA-TP-2309] N84-32388

TIROS N SERIES SATELLITES
Satellite activities of NOAA, 1983 N84-32408
Aspects of the Brazil current system according to SMS-2, NOAA-6, and Tiros-N satellites for 1979 to 1980
[INPE-2975-RPE/450] N84-32962

TITANIUM
Influence of microalloying with titanium and boron on cold resistance of structural steel
[BLL-M-35698-(5828.4)] N84-32483
Role of grain size on the brittle to ductile transition of the strongly ordered alloy Ni3Al
[DE84-014904] N84-32519
High temperature electronics technology
[AD-A143571] N84-32714

TITANIUM ALLOYS
Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506
Effect of alloy chemistry and exposure conditions on the oxidation of titanium
[NASA-TM-86295] N84-32507

TITANIUM BORIDES
Chemical vapor deposition of erosion resistant TiB-2 coatings
[DE84-012351] N84-32518

TITANIUM CARBIDES
Procedure for the electroplating of sintered materials containing carbide or cast alloys of tungsten, molybdenum, titanium or zirconium
[BLL-RISLEY-TRANS-4557-(9091.9)] N84-32484

TITANIUM OXIDES
Defect clusters and electrical properties in transition metal monoxides
[DE84-014851] N84-33242

TOKAMAK DEVICES
Reliability of initial-value MHD calculations of Tokamak disruptions
[DE84-013600] N84-33193
Observation of advanced particle removal rates in pump limiter simulation experiments
[DE84-014327] N84-33202
Plasma dynamics N84-33354

TOMOGRAPHY
On the closure of spaces of sums of ridge functions and the range of the X-ray transform N84-33035

TOPOGRAPHY
Topographic effects of the Alaskan stream on shelf currents
[PB84-205137] N84-32988

TOPOLOGY
Research in monolithic, signal-processing circuits
[AD-A143204] N84-32709
Annals of the Fourier Institute, volume 34, no. 1
[ISSN-0373-0956] N84-33025
Annals of the Fourier Institute, volume 34, no. 2
[ISSN-0373-0956] N84-33038
Bounded Hessian functions N84-33048
Serre's spectral sequence and homotopy N84-33050
IBM's token-ring LAN (Local-Area Network): A base-level communications solution
[AD-A143446] N84-33063

TORUSES
High-power RF compressor
[DE84-013118] N84-32664

TOUGHNESS
Failure prediction of notched pressure vessels using the CTOD approach
[DE84-013057] N84-32883

TOXIC HAZARDS
Passive sampling device for ambient air and personal monitoring
[PB84-210046] N84-32798

TOXICITY
Remote sensing for geobotanical prospecting
N84-32899
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Hydrazine toxicology: Impact on safety and health in military aviation N84-33013
A comparative study in the animal of the toxicity of the combustion products of diverse materials N84-33015

TRACE CONTAMINANTS
Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556

TRACKING (POSITION)
Earth orientation effects on mobile VLBI baselines
N84-32642
Evolution of integrated panel structural design and interfaces for PV power plants N84-32701

TRACKING RADAR
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 4: Functional specification for the prototype Automated Integrated Receive System (AIRS)
[NASA-CR-175264] N84-32649
Simultaneous detection of time coincident signals in an adaptive Doppler tracker
[AD-D011092] N84-32659

TRACKING STATIONS
The Telecommunications and Data Acquisition Report
[NASA-CR-173885] N84-32622

TRACTION
Mechanical interactions of rough surfaces
[DE84-014097] N84-32841
Solid lubrication design methodology
[NASA-CR-174690] N84-33309

TRAFFIC
Field surveys of carbon monoxide in commercial settings using personal exposure monitors
[PB84-211291] N84-32797

TRAINING ANALYSIS
ADA (trademark) training curriculum. Programming methodology m203 teacher's guide
[AD-A143581] N84-33082
ADA (trademark) training curriculum. Basic ADA programming l202 teacher's guide, volume 1
[AD-A143584] N84-33083

TRAJECTORIES
Uncertainty covariances in robotics applications
[DE84-013417] N84-32843

TRANSCENDENTAL FUNCTIONS
Algorithmic integration of elementary transcendental functions on an algebraic curve N84-33052

TRANSDUCERS
Inductive transducer for displacement-to-frequency conversion N84-32594

TRANSFORMATIONS (MATHEMATICS)
On the closure of spaces of sums of ridge functions and the range of the X-ray transform N84-33035
Asymptotic relative efficiencies of the rank transformation procedure in randomized complete block designs
[DE84-010600] N84-33134

TRANSFORMERS
Conceptual design of a noncontacting power transfer device for the ASPS Vernier system
[NASA-CR-172238] N84-32677
Magnetic switches and circuits, revision 2
[DE84-014141] N84-32725

TRANSIENT RESPONSE
Transient response dynamic module modifications to include static and kinetic friction effects N84-32972

TRANSISTORS
Design of locked microwave oscillators on basis of scattering parameters of transistors operating in large signal mode N84-32606

TRANSITION METALS
Theoretical research program to predict the properties of molecules and clusters containing transition metal atoms
[NASA-CR-173924] N84-32502
Solid state tetrachloroaluminate storage battery having a transition metal chloride cathode
[AD-D011133] N84-32924

TRANSMISSION LINES
Effect of processing conditions on the reliability of crosslinked polyethlene cable insulation
[DE84-014902] N84-32546
Grounding ring for shielded cable
[AD-D011135] N84-32675
Optical power source control system
[AD-D011124] N84-33175

TRANSMISSION LOSS
Intermodulation in protective semiconductor microwave devices N84-32612

TRANSMISSIONS (MACHINE ELEMENTS)
Thermal analysis of a planetary transmission with spherical roller bearings operating after complete loss of oil
[NASA-TP-2367] N84-32824

TRANSMITTERS
Intermodulation distortions in semiconductor microwave receivers and transmitters (survey) N84-32606
Eye safe laser transmitter
[AD-D011145] N84-32779

TRANSONIC COMPRESSORS
Analysis of three-dimensional transonic compressors
[NASA-CR-166580] N84-32356

TRANSONIC FLOW
Subsonic and transonic unsteady- and steady-pressure measurements on a rectangular supercritical wing oscillated in pitch --- wind tunnel tests
[NASA-TM-85765] N84-32348
Improvements in the accuracy and stability of algorithms for the small-disturbance and full-potential equations applied to transonic flows
[NASA-TM-85970] N84-32350
Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351
A linear aerodynamic analysis for unsteady transonic cascades
[NASA-CR-3833] N84-32355
Analysis of three-dimensional transonic compressors
[NASA-CR-166580] N84-32356
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85960] N84-32358

TRANSONIC FLUTTER
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353

TRANSONIC SPEED
Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351

Computer studies of hybrid-slotted working sections with minimum interference at subsonic speeds
[NASA-TM-86002] N84-32370
TRANSPARENCE
Optical distortion analyzer system
[AD-D011127] N84-33176
TRANSPONDERS
Quick Deployment Vehicle (QDV)
[AD-D011060] N84-32563
TRANSPORT AIRCRAFT
Minimum-fuel, 3-dimensional flightpath guidance of transfer jets
[NASA-TP-2326] N84-32394
Aircraft, ships, spacecraft, nuclear plants and quality
[DE84-013262] N84-33166
TRANSPORT PROPERTIES
Two phase system; Interfacial turbulence
[AD-A143182] N84-32754
Electron localization and superconductivity of very thin epitaxially grown ag films on ge(001)
[AD-A143469] N84-33224
Molecule microscopy N84-33337
TRANSPORTATION
Microcomputers in transportation: Software and source book
[PB84-185155] N84-33067
TRANSVERSE WAVES
Transverse flow CW atomic iodine laser system
[AD-D011096] N84-32610
TRAPPED PARTICLES
Trapped particle absorption by the Ring of Jupiter
[NASA-CR-173919] N84-33323
TRAVELING SALESMAN PROBLEM
A simple algorithm for the metric traveling salesman problem N84-32631
TRAVELING WAVE MASERS
Availability of the DSN telemetry data system and its major elements, including the TWM assemblies N84-32639
A study of DSN traveling wave maser system reliability N84-32640
TRAVELING WAVE TUBES
Interrelation between parameters of M-type traveling wave tube N84-32596
Universal control grid modulator
[AD-D011108] N84-32672
DC (Direct-Current) partial-discharge-environmental screening of space TWTs (Traveling Wave Tubes)
[AD-A143230] N84-32710
TREES (MATHEMATICS)
Simulation of large networks of processors by smaller ones
[AD-A143529] N84-33096
TRIBOLOGY
Microstructure and surface chemistry of amorphous alloys important to their friction and wear behavior
[NASA-TM-83762] N84-32506
The friction behavior of semiconductors Si and GaAs in contact with pure metals
[NASA-TM-83779] N84-32531
TRIODES
Breakdown processes in large-area cold-cathode vacuum triodes
[DE84-014026] N84-32617
TROPICAL METEOROLOGY
Southern oscillation-El Nino events: Characteristics, evolution, and precipitation anomalies
[INPE-2976-PRE/436] N84-32983
TROPOSPHERE
Tropospheric delay effects in radio interferometry N84-32636
TRUSSES
Simple examples of non linear truss behavior
[AD-A143368] N84-32662
TUBE HEAT EXCHANGERS
Ceramic component manufacturing technology development — silicon carbide tubing for industrial waste heat recovery
[PB84-215276] N84-32550
TUBE LASERS
Laser utilizing a gaseous lasing medium and method for operating the same
[DE84-014500] N84-32819
TUBES
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers
[AD-A143319] N84-32959
TUNABLE LASERS
Interferometrically tuned laser resonator
[AD-D011125] N84-32600
Visible and near-infrared dissociation lasers
[AD-A143295] N84-32607
TUNGSTEN
High temperature electronics technology
[AD-A143571] N84-32714
TUNGSTEN ALLOYS
Sintered hard metal alloys and process for their manufacture
[CSIR-TRANS-1748] N84-32493
TUNGSTEN CARBIDES
Procedure for the electroplating of sintered materials containing carbide or cast alloys of tungsten, molybdenum, titanium or zirconium
[BLL-RISLEY-TRANS-4557-(9091.9)] N84-32484
Sintered hard metal alloys and process for their manufacture
[CSIR-TRANS-1748] N84-32493
TUNING
Stable asynchronous two-frequency oscillations in Gunn-effect diode with open resonator structure N84-32611
TURBINE BLADES
Turbine blade and vane heat flux sensor development, phase 1
[NASA-CR-168297] N84-32790
TURBOCOMPRESSORS
Investigation of the three-dimensional flow field within a transonic fan rotor: Experiment and analysis
[NASA-TM-83739] N84-32357
TURBOFAN ENGINES
JT15D simulated flight data evaluation
[NASA-CR-172322] N84-32387
Energy efficient engine component development and integration program
[NASA-CR-173684] N84-32389
TURBOGENERATORS
Computer simulation of the heavy-duty turbo-compounded diesel cycle for studies of engine efficiency and performance
[NASA-CR-174755] N84-33306
TURBOJET ENGINE CONTROL
High temperature electronics technology
[AD-A143571] N84-32714
TURBOMACHINE BLADES
Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351
TURBOPAUSE
Turbulent diffusion, dissipation, and winds from calibrated photographs of artificial clouds
[AD-A143231] N84-32956
TURBOPROP AIRCRAFT
Summary of recent NASA propeller research
[NASA-TM-83733] N84-32344
TURBULENCE
Conditional velocity statistics in premixed CH-4-air and C-2H-4-air turbulent flames
[DE84-012257] N84-32464
The structure of the vorticity field in turbulent channel flow. Part 1: Analysis of instantaneous fields and statistical correlations
[NASA-TM-86019] N84-32753
Large HAWT (Horizontal-Axis Wind Turbine) wake measurement and analysis
[DE84-013269] N84-32772
Urban scale variations of turbulence parameters and fluxes
[PB84-209113] N84-32980
TURBULENT BOUNDARY LAYER
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC)
[AD-A143253] N84-32360
The effects of porous material on microbubble skin friction reduction
[AD-A143401] N84-32756
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197995] N84-32773
TURBULENT DIFFUSION
Turbulent diffusion, dissipation, and winds from calibrated photographs of artificial clouds
[AD-A143231] N84-32956
TURBULENT FLOW
Three-dimensional, time-dependent, compressible, turbulent, integral boundary layer equations in general curvilinear coordinates and their numerical solutions N84-32346
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC)
[AD-A143253] N84-32360
A theoretical and experimental study of turbulent evaporating sprays
[NASA-CR-174760] N84-32390
Developing turbulent flow in strongly curved passages of square and circular cross-section
[AD-A143279] N84-32755
Developing turbulent flow in a 180(0) curved pipe and its downstream tangent
[DE84-013391] N84-32767
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 2: Laser velocimeter data
[NASA-CR-168234-VOL-2] N84-33149
TWO DIMENSIONAL FLOW
A linear aerodynamic analysis for unsteady transonic cascades
[NASA-CR-3833] N84-32355
TWO PHASE FLOW
Comparison between two Lysholm engines
[DE84-013696] N84-32571
Two phase system; Interfacial turbulence
[AD-A143182] N84-32754

U

ULTRAHIGH FREQUENCIES
Around-a-mast quadrifilar microstrip antenna
[AD-D011051] N84-32617
ULTRAHIGH VACUUM
Method for making Josephson junctions with contamination-free interfaces utilizing a ZNO contact insulator
[AD-D011057] N84-32671
ULTRASONIC TESTS
Application of elastic wave scattering theory to the detection and characterization of flaws in structural materials
[DE84-013729] N84-32852
ULTRASONICS
The role of the reflection coefficient in precision measurement of ultrasonic attenuation
[NASA-TM-83788] N84-32849
ULTRAVIOLET ABSORPTION
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178
Ultraviolet interstellar absorption toward stars in the small Magellanic cloud N84-33313
ULTRAVIOLET PHOTOGRAPHY
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178
ULTRAVIOLET RADIATION
Properties of UV-cured polyurethane acrylates: Effect of polyol type and molecular weight
[AD-A143176] N84-32537
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178
The ionization structure of planetary nebulae V NGC 3242
[NASA-CR-173914] N84-33322
ULTRAVIOLET SPECTRA
Observations of the ultraviolet spectra of helium (DB) white dwarfs and a study of the ultraviolet spectra of white dwarfs containing carbon
[NASA-CR-173689] N84-33310
ULTRAVIOLET TELESCOPES
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178
UNDERWATER ACOUSTICS
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874
UNDERWATER ENGINEERING
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874
UNDERWATER STRUCTURES
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32875
UNDERWATER VEHICLES
Quick Deployment Vehicle (QDV)
[AD-D011060] N84-32563
UNIQUENESS
The well-posedness of the Kuramoto-Sivashinsky equation
[NASA-CR-172431] N84-33053
UNIQUENESS THEOREM
Uniqueness in the Cauchy problem for second order operators with real symbols N84-33045
UNIVERSE
Axions, neutrinos and strings: The formation of structure in an SO(10) universe
[NASA-TM-86139] N84-33317
UNIVERSITIES
A study of the extent of automation in small college libraries and relationships of attitudes of library directors toward it N84-33260

UNIVERSITY PROGRAM
Research in computer science
[NASA-CR-173857] N84-33056
UNSTEADY FLOW
Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351
Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353
A linear aerodynamic analysis for unsteady transonic cascades
[NASA-CR-3833] N84-32355
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197995] N84-32773
UPLINKING
High power K sub a -band transmitter for planetary radar and spacecraft uplink N84-32625
UPPER ATMOSPHERE
Investigation of the external flow analysis for density measurements at high altitude — shuttle upper atmosphere mass spectrometer experiment
[NASA-CR-173881] N84-32352
URANUS (PLANET)
Geometrical relationships of Pioneer 11 to Uranus and Voyager 2 in 1985-86
[NASA-CR-173675] N84-32406
URANUS RINGS
Trapped particle absorption by the Ring of Jupiter
[NASA-CR-173919] N84-33323
URBAN TRANSPORTATION
Field surveys of carbon monoxide in commercial settings using personal exposure monitors
[PB84-211291] N84-32797
Workshop on Systems Analysis
[PB84-194661] N84-33138
Scenario planning: Energy considerations in the long range urban transportation planning process
[DE84-013590] N84-33306
USER MANUALS (COMPUTER PROGRAMS)
Mathematical model of electrostatic precipitation (revision 3). Volume 2: User's manual
[PB84-212687] N84-32470
COSMIC/NASTRAN free-field input N84-32665
USER REQUIREMENTS
Autonomous Integrated Receive System (AIRS) requirements definition. Volume 4: Functional specification for the prototype Automated Integrated Receive System (AIRS)
[NASA-CR-175264] N84-32649
Langley experience with ADABAS/NATURAL N84-33272
UTAH
Diagenesis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938

V

VACUUM DEPOSITION
Method for making Josephson junctions with contamination-free interfaces utilizing a ZNO contact insulator
[AD-D011057] N84-32671
VALVES
Linear motion valve
[NASA-CASE-MSC-20148-1] N84-32823
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32650
VANADIUM
Composition and structure of multicomponent vanadium- and niobium-base coatings
[BLL-M-35657-(5828.4)] N84-32474
VANADIUM OXIDES
Defect clusters and electrical properties in transition metal monoxides
[DE84-014851] N84-33242
VAPOR DEPOSITION
Chemical vapor deposition of erosion resistant TIB-2 coatings
[DE84-012351] N84-32518
Replication of high power laser mirrors
[AD-D011140] N84-33177
Low temperature epitaxial deposition of silicon by plasma enhanced CVD (Chemical Vapor Deposition)
[AD-A143208] N84-33216
VAPOR PHASE EPITAXY
Preparation of high purity Ga(X)In(1-x) by the VPE-hydride method with a gallium-indium alloy source
[AD-A143275] N84-33218
VAPOR PHASES
Soldering method for cable connectors
[AD-D011103] N84-32718
Superfluid helium 2 liquid-vapor phase separation: Technology assessment
[NASA-TM-85866] N84-32752
VECTOR SPACES
Wave fronts to infinity of real analytic functions N84-33031
On the closure of spaces of sums of ridge functions and the range of the X-ray transform N84-33035
VECTORS (MATHEMATICS)
Fast solutions to the steady state compressible and incompressible fluid dynamic equations
[NASA-CR-172416] N84-32349
Solving low density knapsacks
[DE84-008964] N84-33065
VELOCITY
Calculation of the pressure distribution on a pitching airfoil with application to the Darrieus rotor
[DE84-013571] N84-32363
Manipulation of the mixing process between streams of different velocity and temperature in the presence of pressure gradient
[AD-A143467] N84-32757
Petrography and ultrasonic wave velocity in the Admire Formation (Permian), Kansas N84-32945
Modified Thomson parabola ion spectrometers for use in laser generated plasma experiments
[AD-A143298] N84-33190
VELOCITY MEASUREMENT
Effects of system and geometrical parameters on the flow of Class-B solids in overflow standpipes
[DE84-013948] N84-32762
VENUS PROBES
Telecommunications and data acquisition support for the Pioneer Venus Project: Pioners 12 and 13, prelaunch through March 1984
[NASA-CR-173893] N84-32403
VERTICAL ORIENTATION
Direct measurement of Earth's vertical deflection using global positioning system
[AD-D011099] N84-32373
VERTICAL TAKEOFF AIRCRAFT
Axisymmetric thrust augmenting ejector with discrete primary air slot nozzles
[AD-D011129] N84-32366
VERY HIGH FREQUENCIES
Spectrum resource assessment in the 162-174 MHz frequency band — land mobile communications
[PB84-210244] N84-32667
VERY LARGE SCALE INTEGRATION
Multi-valued LSI/VLSI logic design N84-32670
Wafer-scale laser pantography. Part 6: Direct-write interconnection of VLSI gate arrays
[DE84-012676] N84-32815
Dynamic programming and transitive closure on linear pipelines
[AD-A143527] N84-33079
Custom integrated circuits N84-33361
VERY LONG BASE INTERFEROMETRY
Telecommunications and data acquisition support for the Pioneer Venus Project: Pioners 12 and 13, prelaunch through March 1984
[NASA-CR-173893] N84-32403
Earth orientation effects on mobile VLBI baselines N84-32642
Mojave base station implementation N84-32643
VERY LOW FREQUENCIES
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32946
VESTS
Position and restraint system for aircrewman
[AD-D011058] N84-32364
VIBRATION
Passive line-of-sight stabilization for an infrared sensor
[AD-A143305] N84-32792
VIBRATION MEASUREMENT
Random vibrations of multicomponent structures N84-32854
VIBRATIONAL SPECTRA
Raman and infrared spectroscopy of molecules adsorbed on metal electrodes
[AD-A143466] N84-32454
VIBRATIONAL STRESS
Random vibrations of multicomponent structures N84-32854
VIDEO DATA
Method of measuring optical properties of a transparency
[AD-D011117] N84-33188
VIDEO EQUIPMENT
Comparison of CRT (Cathode Ray Tube) antireflection filters
[PB84-202753] N84-32742
VINYL POLYMERS
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers
[AD-A143202] N84-32451
Electrically conducting poly(vinyl acetate)
[AD-A143199] N84-32538
VIRUSES
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995
VISCOUS FLOW
Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85980] N84-32358
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
VISCOUS FLUIDS
Certain assumptions of theory of hydrodynamic lubrication during metal pressure working
[BLL-M-35681-(5828.4)] N84-32822
VISION
Portable visual function tester
[AD-D011105] N84-32795
Visual function and the definition of thresholds for exposure to laser radiation N84-33019
Physiology N84-33363
VISUAL ACUITY
Portable visual function tester
[AD-D011105] N84-32795
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172
VISUAL DISCRIMINATION
Visual information transfer. 1: Assessment of specific information needs. 2: The effects of degraded motion feedback. 3: Parameters of appropriate instrument scanning behavior
[NASA-CR-173913] N84-33020
Physiology N84-33363
VISUAL FIELDS
Visual field perimeter and psychomotor tracking performance measuring apparatus
[AD-D011056] N84-32775
VISUAL FLIGHT
Visual information transfer. 1: Assessment of specific information needs. 2: The effects of degraded motion feedback. 3: Parameters of appropriate instrument scanning behavior
[NASA-CR-173913] N84-33020
VISUAL PERCEPTION
Visual field perimeter and psychomotor tracking performance measuring apparatus
[AD-D011056] N84-32775
Occupational Medicine Relevant to Aviation Medicine
[AGARD-CP-341] N84-33011
Visual perception in systems management in aeronautics N84-33017
A study of methods to predict and measure the transmission of sound through the walls of light aircraft. A survey of techniques for visualization of noise fields
[NASA-CR-173917] N84-33146
VISUAL STIMULI
Physiology N84-33363
VITAMINS
Multivariate curve resolution in liquid chromatography
[DE84-013797] N84-32466
VITON
Physical techniques for profiling heterogeneous polymer degradation
[DE84-013807] N84-32547
VITRIFICATION
The transformation of liquid to amorphous solid: The time to vitrify for styrene polymerization
[AD-A143228] N84-32452
VOICE COMMUNICATION
RLE Progress Report no. 126
[RLE-PR-126] N84-33336
Speech communication N84-33358
VOIDS
Effective thermophysical and elastic properties of materials with voids
[DE84-013942] N84-32465
VOLCANOES
The climatic impact of volcanic activity N84-32963
Morphologic studies of the Moon and planets
[NASA-CR-173686] N84-33319
VOLTAGE CONTROLLED OSCILLATORS
Phase shift keying apparatus
[AD-D011119] N84-32660
Research in monolithic, signal-processing circuits
[AD-A143204] N84-32709
VOLUME
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32654

VORTICES
The structure of the vorticity field in turbulent channel flow. Part 1: Analysis of instantaneous fields and statistical correlations
[NASA-TM-86019] N84-32753
VORTICITY
Optimal measurement of ice-sheet deformation from surface-marker arrays
[NASA-CR-173677] N84-32950
Topographic effects of the Alaskan stream on shelf currents
[PB84-205137] N84-32988
VORTICITY EQUATIONS
On the finite element approximation of the stream function-vorticity equations
[AD-A143506] N84-32758
VOYAGER 2 SPACECRAFT
Geometrical relationships of Pioneer 11 to Uranus and Voyager 2 in 1985-86
[NASA-CR-173675] N84-32406

W

WAFERS
Three-dimensional circuit layouts
[AD-A143430] N84-32713
WAKES
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
Large HAWT (Horizontal-Axis Wind Turbine) wake measurement and analysis
[DE84-013269] N84-32772
WALLS
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers
[AD-A143319] N84-32959
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192
WAR GAMES
Rand's experience in applying artificial intelligence techniques to strategic-level military-political war gaming
[P-6977] N84-33137
WASHINGTON
Lower tertiary biostratigraphy and paleoecology of the Quillcene-Discovery Bay area, northeast Olympic Peninsula, Washington N84-32943
WASTE DISPOSAL
Mechanical seal program
[DE84-012421] N84-32838
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States
[DE84-013672] N84-32901
WASTE ENERGY UTILIZATION
High temperature metallic recuperator
[PB84-207869] N84-32575
Steam bottoming cycle for an adiabatic diesel engine
[NASA-CR-168255] N84-33304
WASTE HEAT
Steam bottoming cycle for an adiabatic diesel engine
[NASA-CR-168255] N84-33304
WASTE TREATMENT
Workshop on Systems Analysis
[PB84-194661] N84-33138
WASTE WATER
Construction and evaluation of a flow test stand
[PB84-201561] N84-32906
WATER
Molecule microscopy N84-33337
WATER DEPTH
Underwater depth telemetry
[AD-D011054] N84-32418
WATER QUALITY
National environmental monitoring
[GPO-28-186] N84-32933
WATER RESOURCES
Agriculture and water use: Present and future issues
[GPO-30-509] N84-32897
WATERSHEDS
A geographic information system for regional hydrologic modeling N84-32891
Geomorphic approach to hydrograph synthesis, with potential for application to ungaged watersheds
[PB84-190115] N84-32904
WAVE ATTENUATION
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-173916] N84-32645
The role of the reflection coefficient in precision measurement of ultrasonic attenuation
[NASA-TM-83786] N84-32849
WAVE EQUATIONS
An integral equation for the solution of nonlinear wave equations N84-32347
WAVE FRONTS
Wave fronts to infinity of real analytic functions N84-33031
WAVE INTERACTION
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere N84-32948
Wave propagation in dense geophysical media
[AD-A143213] N84-32955
WAVE PROPAGATION
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-006] N84-32580
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651
Wave propagation in dense geophysical media
[AD-A143213] N84-32955
On accuracy conditions for the numerical computation of waves
[NASA-CR-172433] N84-33111
Numerical diffraction by a uniform grid
[DE84-012861] N84-33121
Coupling of Rayleigh-like waves with zero sound modes in normal He-3
[DE84-010519] N84-33153
Propagation and absorption of electromagnetic waves in fully relativistic plasmas
[DE84-013627] N84-33204
Electromagnetic wave theory and remote sensing N84-33350
WAVE REFLECTION
Reflection of electromagnetic waves from inhomogeneous media N84-32586
WAVE SCATTERING
Application of elastic wave scattering theory to the detection and characterization of flaws in structural materials
[DE84-013729] N84-32852
WAVEFORMS
Signal waveform detector using synthetic FM demodulation
[AD-D011055] N84-32618
WAVEGUIDES
Intermodulation in protective semiconductor microwave devices N84-32612
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-173916] N84-32645
Machined two-piece microwave waveguide
[AD-D011088] N84-32715
WAVELENGTH DIVISION MULTIPLEXING
Definition, analysis and development of an optical data distribution network for integrated avionics and control systems. Part 2: Component development and system integration
[NASA-CR-172429] N84-33181
WEAPON SYSTEMS
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers
[AD-A143318] N84-32655
An evaluation of two reliability and maintainability information systems
[AD-A143436] N84-33290
WEAR
Method for the particle size independent spectrometric determination of metal particles in lubricating oils and hydraulic fluids
[AD-D011121] N84-32445
Microstructure and surface chemistry of amorphous alloys important to their friction and wear behavior
[NASA-TM-83762] N84-32508
Microstructure, mechanical properties and two-body abrasive wear resistance of an Fe-3Cr-C based ultra-high strength steel
[DE84-014605] N84-32520
Friction and wear studies of liquid metal wetted, metallic fiber brushes
[AD-A143473] N84-32831
Engine wear with methanol fuel in a nitrogen-free environment
[AD-A143530] N84-32833
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32850
WEAR INHIBITORS
Swedish research in high-temperature ceramics, superalloys N84-33142
WEAR TESTS
Slavutich high-cobalt WC-Co-matrix alloy
[CSIR-TRANS-1739] N84-32490
WEATHER FORECASTING
Agriculture weather services
[GPO-27-913] N84-32966
Hurricane Alicia: Prediction, damage and recovery efforts
[GPO-33-446] N84-32968
Experiments in objective aviation weather forecasting using upper-level steering
[AD-A143393] N84-32971
Climate prediction. Part 1: Cyclone frequency
[AD-A143576] N84-32973
Mariners Weather Log, Volume 28, Number 2, April-May-June 1984
[PB84-204569] N84-32978
Seasonal precipitation forecasting with a 6 to 7 month lead time in the Pacific Northwest using an information theoretic model
[PB84-207018] N84-32979
WEIGHTLESSNESS
Publications of the NASA space biology program for 1980 - 1984 — bibliographies
[NASA-TM-86857] N84-32990
WELDED JOINTS
The importance of impact pressure in the development of the process of formation of bonds between metals in the solid phase
[BLL-M-35656-(5828.4)] N84-32473
Ferrous alloy metallurgy, liquid lithium corrosion and welding
[DE84-014656] N84-32517
Aircraft landing dynamics facility carriage weld test program
[NASA-TM-85802] N84-32827
Microstructural analysis for series 300 stainless steel sheet welds and tensile samples
[DE84-008513] N84-32837
Fatigue behavior of welded joints subjected to variable amplitude stresses
[PB84-207620] N84-32888
WELDED STRUCTURES
Robotisation of dye penetrant inspection: A study of a prototype and its development
[BLL-RISLEY-TRANS-4585-(9091.9)] N84-32847
WELDING
Aircraft landing dynamics facility carriage weld test program
[NASA-TM-85802] N84-32827
WELLS
Petrography and ultrasonic wave velocity in the Admire Formation (Permian), Kansas N84-32945
WHEATSTONE BRIDGES
Three-wire static strain gage apparatus
[AD-D011130] N84-32776
WHITE DWARF STARS
Observations of the ultraviolet spectra of helium (DB) white dwarfs and a study of the ultraviolet spectra of white dwarfs containing carbon
[NASA-CR-173889] N84-33310
WIND (METEOROLOGY)
Wind loading on solar concentrators: Some general considerations
[NASA-CR-173896] N84-32915
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964
WIND EFFECTS
Aircraft liftmeter
[NASA-CASE-LAR-12518-1] N84-32383
WIND PROFILES
Wind shear for large wind turbine generators at selected tail tower sites
[DE84-011790] N84-32974
WIND SHEAR
Aircraft liftmeter
[NASA-CASE-LAR-12518-1] N84-32383
Wind shear for large wind turbine generators at selected tail tower sites
[DE84-011790] N84-32974
WIND TUNNEL TESTS
Subsonic and transonic unsteady- and steady-pressure measurements on a rectangular supercritical wing oscillated in pitch — wind tunnel tests
[NASA-TM-85765] N84-32348
JT15D simulated flight data evaluation
[NASA-CR-172322] N84-32387
Technical evaluation report on the Fluid Dynamics Panel Symposium on Wind Tunnels and Testing Techniques
[AGARD-AR-193] N84-32402
Columbia: The first five flights. Entry heating data series. Volume 6: The upper leeside surface centerline
[NASA-CR-171795] N84-32414
Aerothermodynamic data base
[NASA-CR-171807] N84-32415
WIND TUNNEL WALLS
Technical evaluation report on the Fluid Dynamics Panel Symposium on Wind Tunnels and Testing Techniques
[AGARD-AR-193] N84-32402

WIND TUNNELS
Computer studies of hybrid-slotted working sections with minimum interference at subsonic speeds
[NASA-TM-86002] N84-32379
WIND TURBINES
Design of a digital telemetry data collection system
[DE84-013916] N84-32420
Large HAWT (Horizontal-Axis Wind Turbine) wake measurement and analysis
[DE84-013269] N84-32772
Verification of hourly forecasts of wind turbine power output
[PNL-4900] N84-32914
Investigation of Doubly-Fed Machine in Variable Speed Applications
[DE84-012943] N84-32928
Wind shear for large wind turbine generators at selected tall tower sites
[DE84-011790] N84-32974
WIND VELOCITY
Aircraft liftmeter
[NASA-CASE-LAR-12518-1] N84-32383
Wind shear for large wind turbine generators at selected tall tower sites
[DE84-011790] N84-32974
WIND VELOCITY MEASUREMENT
Aircraft liftmeter
[NASA-CASE-LAR-12518-1] N84-32383
Air data position-error calibration using state reconstruction techniques
[NASA-TM-86029] N84-32384
Basic principles and recent observations of rotationally sampled wind
[DE84-013267] N84-32976
WINDPOWER UTILIZATION
Large HAWT (Horizontal-Axis Wind Turbine) wake measurement and analysis
[DE84-013269] N84-32772
Verification of hourly forecasts of wind turbine power output
[PNL-4900] N84-32914
WINDPOWERED GENERATORS
Investigation of Doubly-Fed Machine in Variable Speed Applications
[DE84-012943] N84-32928
Wind shear for large wind turbine generators at selected tall tower sites
[DE84-011790] N84-32974
WING LOADING
A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers
[NASA-TM-85873] N84-32393
WING OSCILLATIONS
Subsonic and transonic unsteady- and steady-pressure measurements on a rectangular supercritical wing oscillated in pitch — wind tunnel tests
[NASA-TM-85765] N84-32348
WINGS
Design of a composite wing extension for a general aviation aircraft
[NASA-CR-173832] N84-32377
Piezoelectric deicing device
[NASA-CASE-LEW-13773-2] N84-32782
WINTER
Seasonal precipitation forecasting with a 6 to 7 month lead time in the Pacific Northwest using an information theoretic model
[PB84-207018] N84-32979
WIRING
DC wiring system grounding and ground fault protection issues for central station photovoltaic power plants
N84-32695
WORDS (LANGUAGE)
Linguistics N84-33359
WORKING FLUIDS
Investigation of thermal stability of fluorinol-85 and 2-methylpyridine-water as Rankine cycle power system working fluids
[DE84-006420] N84-32559
WYOMING
Diagenesis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938

X

X RAY ANALYSIS
On the closure of spaces of sums of ridge functions and the range of the X-ray transform N84-33035
X RAY ASTRONOMY
Microwave and X-ray observations of delayed brightenings at sites remote from the primary flare locations
[NASA-TM-86140] N84-33326
X RAY SCATTERING
X-ray diffuse scattering N84-33341
Optical spectroscopy of disordered materials and X-ray scattering from surfaces N84-33345
X RAY SOURCES
The broad-band X-ray spectrum of a QSO sample
[NASA-TM-85071] N84-33333
X RAY SPECTRA
The broad-band X-ray spectrum of a QSO sample
[NASA-TM-85071] N84-33333
X RAY SPECTROSCOPY
X-ray spectroscopy of solids under pressure
[DE84-013790] N84-33237
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control
[NASA-CR-173878] N84-33315
X RAY TELESCOPES
Research relative to high energy astrophysics — large area modular array of reflectors, X-ray spectroscopy, and thermal control
[NASA-CR-173878] N84-33315
X RAYS
Polynominal grating
[AD-D011090] N84-33186

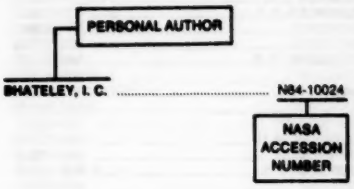
Y

YEAST
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts
N84-32998
YTTERBIUM
Pressure-dependent resistive behavior of YbBe13
[DE84-010068] N84-32514
YTTRIUM OXIDES
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner
[NASA-CR-174691] N84-32504

Z

ZEEMAN EFFECT
Magnetic fluorescent lamp
[DE84-014231] N84-32740
ZERO ANGLE OF ATTACK
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
ZERO SOUND
Coupling of Rayleigh-like waves with zero sound modes in normal He-3
[DE84-010519] N84-33153
ZINC
Remote sensing for geobotanical prospecting
N84-32889
ZIRCONIUM CARBIDES
Procedure for the electroplating of sintered materials containing carbide or cast alloys of tungsten, molybdenum, titanium or zirconium
[BLL-RISLEY-TRANS-4557-(9091.9)] N84-32484
ZONE MELTING
Laser furnace technology for zone refining
[NASA-TM-86459] N84-32805
Submicron structures technology and research
N84-33353

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABED, E. H. N84-33120
ADAMCZYK, J. J. N84-32351
ADAMS N84-32391
ADAMS, R. G. N84-32842
ADLER, R. J. N84-33163
N84-33164
ADNEY, P. S. N84-32377
ADOLF, H. G. N84-32555
AFSAR, M. N. N84-33225
AGGARWAL, B. B. N84-33309
AGGARWAL, R. L. N84-33348
AGRAWAL, S. K. N84-32400
AGUIRRE, S. N84-32634
AHERRON, R. M. N84-32784
AHMAD-BITAR, R. N84-33339
AITHAL, A. R. N84-33109
ALARIO, J. P. N84-32748
ALBERTSON, M. R. N84-33060
ALBRIGHT, N. W. N84-32995
ALEXOVICH, R. E. N84-32789
ALINHAC, S. N84-33045
ALLEN, J. N84-33336
N84-33358
N84-33361
ALLEN, S. L. N84-32642
ALUMBAUGH, R. L. N84-32543
AMALBERTI, R. N84-33017
ANDEEN, C. G. N84-32449
N84-32450
N84-32538
N84-33215
ANDELMAN, D. N84-33342
ANDERSON, A. J. N84-32701
ANDERSON, E. H. N84-33353
ANDERSON, M. R. N84-32896
ANDERSON, P. J. N84-32760
N84-32761
N84-32949
ANDERSON, R. L. N84-32925
ANDRADE, Z. N84-33358
ANDREYEV, A. B. N84-32593
ANDREYEV, N. I. N84-33101
ANGELO, J., JR. N84-33169
ANUTA, P. E. N84-32893
AONO, M. N84-32568
ARCHANGELI, D. N84-33359
ARDUINI, R. F. N84-32784
ARMSTRONG, R. N84-33361
ARNETT, J. C. N84-32687
N84-32701
N84-32705
ARNOLD, F. E. N84-32544
ARON, P. R. N84-32536
ARONHIME, M. T. N84-32452
ASMUSSEN, J. N84-32682
ASSANIS, D. N. N84-33306
ATAYANTS, B. A. N84-32597
ATKINSON, W. H. N84-32790
ATWATER, H. A. N84-33353
AUER, H. N84-32980
AVDEEV, V. P. N84-33104
AVERETT, W. J. N84-32906
AXTON, R. N84-32926
AZZOLA, J. N84-32787

B

BAGDASARYAN, S. T. N84-32582
BAGGEROER, A. B. N84-33357
BAILEY, A. D. N84-32958
BAILEY, B. K. N84-32552
BAILEY, V. L. N84-33157
BAILEY, W. C. N84-32799
BAINBRIDGE, B. L. N84-32796
BAKER, D. N. N84-32954
BAMBERGER, A. N84-33121
BAMJI, C. N84-33361
BANAS, R. M. N84-32835
BANKS, B. N84-32782
BAR-YAM, Y. N84-33338
BARABOY, V. A. N84-33002
BARANOV, M. A. N84-32499
BARANOWSKI, L. C. N84-32410
BARAS, P. N84-33034
BARAT, C. N84-33332
BARCLAY, J. A. N84-32515
BARKER, D. B. N84-32880
BARKER, T. N84-33322
BAROSH, P. N84-32901
BARRETT, A. H. N84-33349
BARRETT, J. L. N84-32957
BARRETT, J. W. N84-33349
BARRY, R. G. N84-32896
BATCHELOR, D. B. N84-33204
BATISTA, P. P. N84-32953
BAYLISS, A. N84-33111
BEAL, E. J. N84-32553
BEARD, R. M. N84-32563
BEATTIE, K. R. N84-33151
BEAVER, P. W. N84-32878
BECIA, P. N84-33346
BECK, J. V. N84-32796
BECK, R. A. S. N84-32361
BECKERLE, J. D. N84-33340
BECKMAN, R. J. N84-33135
N84-33136
BEHRISCH, R. N84-33199
BEITZELL, J. N84-33291
N84-33292
BEKEFI, G. N84-33354
BELIAN, R. D. N84-32954
BELT, R. A. N84-32673
BELYAEV, I. V. N84-32497
BELYAEVA, O. V. N84-32443
BENDEL, W. L. N84-32654
BERAUN, R. N84-32927
BERBENTE, C. N84-32362
BERDNIKOV, V. I. N84-32444
BERGMARK, U. N84-33142
BERKER, A. N. N84-33342
BERMAN, R. H. N84-33354
BERMAN, S. M. N94-32740
BERNARDI, D. N84-32731
BERNHARD, R. N84-33145
N84-33146
BERS, A. N84-33354
BERTIN, G. N84-33354
BEVER, R. S. N84-32681
BEZLER, P. N84-32684
BEZRUCHENKO, V. I. N84-32599
BHANJI, A. M. N84-32625
BHASKAR, S. K. N84-33096
BHATTACHARJEE, T. N84-33348
BICKERS, B. H. N84-32842
BICKES, R. W., JR. N84-32558
BIDDLE, J. R. N84-32916
N84-32917
BIENKOWSKI, G. K. N84-32352
BIKSON, T. K. N84-33264
N84-33266
BILALOV, S. B. N84-32487
BIRGENEAU, R. J. N84-33336
N84-33341
BIRX, D. L. N84-33157
BISHOP, W. S. N84-32906
BITTENCOURT, G. N84-33110
BITTKER, D. A. N84-32446
BIWER, R. L. N84-32721
BJORKSTAM, J. L. N84-33238
BLAKE, J. B. N84-32954
BLANCHARD, A. J. N84-32785
BLANCHARD, L. O. N84-32718
BLAND, S. R. N84-32353
BLANKSCHTEIN, D. N84-33342
BOBB, L. C. N84-32800
BOBER, L. J. N84-32344
BOBINA, M. N. N84-32474
BOCK, L. K. N84-33290
BOCK, M. E. N84-33115
BOCKOVSKII, A. M. N84-32490
BODANSKY, D. N84-33335
BOEBINGER, G. N84-33348
BOGACZ, S. A. N84-33153
BOGLER, P. L. N84-33355
BOGUSHEVICH, M. S. N84-33000
BOLLINGER, L. M. N84-33158
BOLLINGER, W. A. N84-33099
BOMAN, J. N84-33035
BONADIES, G. N. N84-32836
BONDURANT, R. S. N84-33355
BONG, S. N84-32785
BOOKER, J. M. N84-33135
BOONE, D. H. N84-33247
BOQUET, P. N84-32475
BORDEN, A. R. N84-32737
BORDEN, C. S. N84-32922
BORDLEY, T. E. N84-33357
BORGHETTI, J. N84-32958
BOROUGHS, R. R. N84-32869
BOROVIKOV, N. F. N84-32533
BORSIG, E. N84-32530
BOSCHETTI, C. N84-33212
BOULDIN, D. W. N84-32724
BOULOS, M. I. N84-33200
N84-33203
BOURGEADE, A. N84-32356
BOVENKERK, R. L. N84-33309
BOWIN, C. N84-32894
BOYLE, R. J. N84-32368
BRABY, L. A. N84-32791
BRADLEY, D. N84-33358
BRAGER, H. R. N84-32513
BRANDHORST, H. W., JR. N84-32426
BRAUSCH, J. F. N84-33148
N84-33149
N84-33150
BRAZIL, S. N84-32629
BREDA, I. R. N84-32475
BRENNOCK, D. J. N84-32362
BREWSTER, L. L. N84-33076
BRICE, L. N84-33088
BRICKELL, E. F. N84-33085
BRIDGES, P. D. N84-32375
BRIDGES, W. F. N84-32776
BRIDY, D. J. N84-33312
BRIGGS, G. A. N84-32981
BROCK, G. H. N84-33270
BROCK, J. N84-33345
BROOK, M. N84-32788
BROWN, D. R. N84-32345
BROWN, K. A. N84-32574
BROWN, M. C. N84-33362
BROWN, N. J. N84-32459
BROWN, R. E. N84-32774
BROWN, S. C. N84-32393
BROWN, W. K. N84-32866
N84-32868
BRYAN, R. A. N84-33161
BUCHWALTER, H. N84-33041
BUCK, J. W. N84-32772
BUCKLEY, D. H. N84-32508
N84-32825
BUDAI, J. M. N84-32938
BUDEN, D. N84-33169
BUHRMAN, J. N84-32401

BULGAKOV, B. M. N84-32611
BUNKER, B. C. N84-32732
BURA, S. T. N84-32491
BURKE, B. F. N84-33349
BURLINGAME, P. J. N84-32708
BURNS, D. A. N84-32965
BURTON, R. L. N84-33198
BUSKIRK, F. R. N84-32657
N84-33155
BUTLER, P. C. N84-32734
BUTLER, T. G. N84-32870
N84-32871
BUTTON, K. J. N84-33225
BUTTRAM, M. T. N84-32461

C

CAFLISCH, R. G. N84-33342
CAHEN, D. N84-32926
CALABRIA, J. A. N84-32373
CALAME, J. P. N84-32449
N84-32536
CALISE, A. J. N84-33071
CALO, J. M. N84-32959
CALVET, J. N. N84-32847
CAMILLI, P. P. G. N84-33074
CAMPBELL, D. V. N84-32717
CANNON, G. A. N84-32968
CAPLAN, M. N84-32625
CAPUTO, A. J. N84-32518
CARAFOLI, E. N84-32362
CARLEY, L. R. N84-33363
CARLSON, J. H., JR. N84-32420
CARLSON, L. W. N84-32846
CARLSON, R. S. N84-32726
CARPENDER, M. N84-33255
N84-33256
CARRERAS, B. A. N84-33193
CARSON, G. T., JR. N84-32354
CARTER, R. D. G. N84-32361
CARTIER, P. N84-33025
N84-33038
CASE, A. L. N84-32661
CASE, W. R. N84-32667
CASPAR, J. R. N84-32355
CASSIER, G. N84-33041
CASTI, T. E. N84-33327
CAVALCANTI, I. F. A. N84-32963
CEBALLOS, D. C. N84-33100
CEPUROV, A. I. N84-33205
CEYER, S. T. N84-33340
CHADWICK, A. V. N84-33215
CHAIKIN, P. M. N84-33224
CHALKOV, V. S. N84-32660
CHAMBERLAIN, M. T. N84-32957
CHAN, G. C. N84-32665
CHAN, I. H. N84-32762
CHANCE, K. V. N84-32951
CHANDLER, J. A. N84-32823
CHANG, G. E. C. N84-32828
CHANG, H. C. N84-32948
CHANG, Y. W. N84-32766
CHANTY, J. M. N84-33344
CHAO, Y. C. N84-32395
CHAO, Y. M. N84-33360
CHAO, Y. S. N84-33352
CHARPENTIER, P. N84-33029
CHEN, A. B. N84-33221
CHEN, D. P. N84-33353
CHEN, H. F. N84-33128
CHEN, S. H. N84-33352
CHENG, R. K. N84-32464
CHERENKOVA, Y. V. N84-32568
CHERNYSHEV, A. S. N84-32598
CHESTER, J. B. N84-33152
CHEVALERAUD, J. P. N84-33019
CHEW, W. C. N84-33350
CHIAN, C. T. N84-32638
CHIE, C. M. N84-32648
N84-32647
N84-32648
N84-32649
CHILENSKAS, A. A. N84-32722
CHIN, H. W. N84-32815
CHING, J. K. S. N84-32980
CHOMSKY, A. N. N84-33359
CHOU, S. Y. N84-33353
CHRIEN, R. E. N84-33162
CHRISTENSEN, R. A. N84-32979
CHRISTENSEN, T. E. N84-32663
CHRISTIAN, J. B. N84-32529
CHRISTOPHOROU, L. G. N84-32724
CHUANG, H. N84-33350
CHUANG, S. L. N84-32645
N84-33350
CHUNG, W. N84-32380
CIHAL, V. N84-32477
CLARK, R. K. N84-32505
N84-32506
N84-32507
CLARKE, J. F. N84-32960
CLARKE, P. B. N84-32831
CLEAR, K. C. N84-32578
CLIFFORD, J. E. N84-32736
CLINE, T. L. N84-33332
CLOUGH, R. L. N84-32547
COAN, B. A. N84-33077
COATES, G. D. N84-33020
COCHRANE, E. H. N84-32921
N84-32922
COE, H. H. N84-32624
COFFIELD, F. E. N84-32663
COHEN, D. B. N84-32704
COHEN, J. B. N84-33242
COHEN, M. M. N84-32715
COLE, J. H. N84-32618
COLEMAN, D. P. N84-33164
COLLINS, E. N84-32423
COLTON, M. N84-33032
COMMISSO, R. J. N84-32711
COMSTOCK, J. R., JR. N84-33020
CONKLIN, S. R. N84-32543
CONN, R. W. N84-33202
CONNELL, J. N84-33066
CONNELL, J. R. N84-32976
CONNOLLY, P. E. N84-32373
COOLEY, J. E. N84-32705
COOPER, S. L. N84-32537
COPELAND, G. L. N84-32763
COPPI, B. N84-33354
CORBETT, J. D. N84-33231
CORK, C. R. N84-32541
CORN, R. M. N84-32454
N84-33184
CORTESELLI, D. N84-33360
COSDEN, T. H. N84-32972
COSTOGUE, E. N. N84-33213
COURANT, D. N84-33019
COURT, L. N84-33019
COURTNEY, T. H. N84-32509
COUTURIER, G. D. N84-32673
COX, A. N. N84-33311
CRAFTS, C. C. N84-32732
CRANE, R. G. N84-32896
CRANNELL, C. J. N84-33325
CRASEMANN, B. N84-33220
CREWS, J. H., JR. N84-32436
CROMBEZ, G. N84-33047
CROSBY, W. N84-32399
CROSS, J. L. N84-32381
CUDDIHY, E. F. N84-32694
CUKAUSKAS, E. J. N84-32671
CULLEY, K. M. N84-32658
CURTIS, S. R. N84-33357
CUTTS, J. A. N84-33285
CYR, M. A. N84-32790

D

DABOIN, S. A. N84-33151
DAFT, R. L. N84-33293
DAGLI, N. N84-33343
DALEY, J. G. N84-32840
DALLING, D. K. N84-32552
DALLY, R. B. N84-32687
DANILCHENKO, V. G. N84-32600
DANLY, M. N84-33358
DAOLE, Y. N84-33217
DAS, P. N84-33228
DAUD, T. N84-32911
DAVARI, B. N84-33228
DAVARIAN, F. N84-32647
DAVENPORT, J. H. N84-33052
DAVIS, D. N84-32900
DAVIS, P. K. N84-33137
DAVIS, W. T. N84-32447
DEACON, D. A. G. N84-32606
DEADRICK, D. S. N84-33357
DEAN, T. N84-32483
DEARDOFF, D. D. N84-32626
DEB, S. K. N84-32926
DEBROY, T. N84-32839
DECHANT, G. N84-32462
DEEL, G. G. N84-32675
DEFAUX, M. N84-33143
DELAHARPE, P. N84-33036
DELCROIX, J. P. N84-33015
DELUCA, L. N84-32554
DELUCA, W. H. N84-32721
DEMATTEO, J. N84-32373
N84-32563
DEMENGEL, F. N84-33048
DEMERDASH, N. A. N84-32707
DENIER, R. N84-33304
DEMIRGIAN, J. N84-32559
DEMOAES, R. V. N84-32409
DEMONVEL, L. B. N84-33025
N84-33038
DENING, J. C. N84-32714
DENNIS, B. R. N84-33326
DEREVYANNYKH, I. M. N84-32596
DERTOUZOS, M. L. N84-33064
DERYABIN, V. A. N84-32496
DESAI, U. D. N84-33332
DESHAZER, L. G. N84-33185
DESJARDINS, S. P. N84-32367
DEUTSCH, D. N84-32347
DEUTSCH, S. N84-32756
DEVERDIERE, Y. C. N84-33025
N84-33038
DIANOVA, V. A. N84-32599
DIAS, L. A. V. N84-33110
DIAS, O. P., JR. N84-33251
DICKERSON, M. H. N84-32975
DIDIERJEAN, A. N84-33050
DIEUDONNE, J. E. N84-32412
N84-32413
DIFILLIPO, D. N84-33344
DILLET, A. N84-32847
DIMITRIADIS, E. N84-32854
DIXON, R. C. N84-32647
DODDS, R. H. N84-32883
DOHERTY, J. N84-32440
DOMBERT, W. E. N84-32702
DOMINQUEZ, C. A. N84-33161
DONALDSON, R. R. N84-32845
DONIVAN, S. N84-32462
DOOLEY, A. H. N84-33046
DORSEY, J. T. N84-32422
DOSTUPOV, B. G. N84-33101
DOUGLAS, S. C. N84-32732
DOVE, W. P. N84-33357
DOW, J. B. N84-32660
DOWDICAN, M. N84-32650
DRAKE, J. B. N84-32765
DREHER, J. W. N84-33349
DREWERY, J. O. N84-32615
DREWES, L. R. N84-33005
DRILLING, J. N84-32677
DROTHING, W. D. N84-32695
DRYER, F. L. N84-32467
DU, Q. N84-33360
DUB, J. F. N84-33208
DUBA, A. G. N84-32723
DUBARD, J. L. N84-32469
N84-32470
DUBOSE, D. A. N84-32991
DUBOWICZ, P. W. N84-32717
DUCAS, T. N84-33339
DUCKWORTH, G. L. N84-33357
DUFF, L. W. N84-32628
DULLEA, R. K. N84-33152
DUNBAR, M. K. N84-32573
DUNLAP, H. L. N84-33222
DUNN, S. A. N84-32749
DUNNING, J. S. N84-32524
DUPREE, T. H. N84-33354
DURBAN, D. M. N84-33267
DUTTON, E. J. N84-32666
DYACHENKO, S. M. N84-32603
DYAKONOVA, N. G. N84-32500
DYAKOV, V. P. N84-32602
DYER, R. M. N84-32655

E

EATOCK, R. A. N84-33362
EBEL, J. N84-32901
ECHIGO, H. N84-32566
ECKE, R. N84-33244
ECKHARDT, C. J. N84-33240
EDDINGTON, D. K. N84-33362
EDEN, J. G. N84-32807
EDENBURN, M. W. N84-32931
EDGAR, D. N84-32901
N84-32962
EDWARDS, J. W. N84-32353
EDWEES, M. E. N84-32907
EGOROV, A. I. N84-32494
EHERNBERGER, L. J. N84-32384
EHLERS, K. W. N84-33192
EINAV, S. N84-32757
EK, D. N84-33169
EKCHIAN, J. A. N84-33306
EKDAHL, C. A. N84-32738
EL-BAZ, F. N84-33319

EL-JAOUHARI, N. N84-33037
ELATTARY, M. A. A. N84-32856
ELBERT, R. F. N84-32979
ELCHURI, V. N84-32878
ELLIOTT, D. L. N84-32974
ELLIS, D. E. N84-33242
ELSENAAR, A. N84-32402
ENGMANN, G. N84-32699
ENTIN, E. P. N84-32485
EPSHTEIN, G. N. N84-32473
ERDOGAN, F. N84-32863
ERICKSON, K. L. N84-32558
ERICKSON, R. E. N84-32381
ERICSON, W. F. N84-32381
ERSTFELD, T. E. N84-33218
ESHERICK, P. N84-32460
ESSIG, A. N84-33337
ESU, E. O. N84-32945
ETHRIDGE, E. C. N84-32569
EVANS-LUTTERODT, K. N84-33341
EVANS, D. W. N84-33172
N84-33173
EVANS, W. D. N84-33332
EVEN, U. N84-32542
EVERSTINE, G. C. N84-32874
EYLON, D. N84-32512
EZEKIEL, S. N84-33344

F

FAETH, G. M. N84-32390
FANG, K. T. N84-33128
FARNUM, B. N84-32432
FARRELL, K. N84-32522
FARROW, J. E. N84-33069
FASICZKA, R. N84-32858
FAULKNER, M. G. N84-32469
N84-32470
FEDONIN, A. I. N84-32593
FELD, Y. N. N84-32584
FELKER, B. N84-32663
FELLOWS, J. N84-32891
FENNELL, J. F. N84-32954
FERBER, R. N84-33213
FERGUSON, G. D. N84-32800
FICHTER, W. B. N84-32877
FIGUEROA, D. R. N84-32450
N84-33215
FILATOV, Y. A. N84-32586
FILHO, A. C. L. N84-33075
FILHO, A. L. N84-33180
FILICE, J. P. N84-33324
FILLIUS, W. N84-33323
FINDEISEN, A. G. N84-32676
FINE, H. A. N84-32763
FINKE, R. N84-32762
FINNEY, J. M. N84-32678
FISHER, B. D. N84-32365
FISK, Z. N84-32514
FISUN, A. I. N84-32611
FITZGIBBON, M. T. R. N84-32409
FITZPATRICK, E. L. N84-33313
FLACHSBART, P. G. N84-32797
FLINN, J. E. N84-32523
FLOWER, M. N84-32901
N84-32962
FLYNN, F. P. N84-32667
FODOR, J. A. N84-33359
FOKEYEV, L. G. N84-32587
FONSTAD, C. G. N84-33343
FONTANELLA, J. J. N84-32449
N84-32450
N84-32451
N84-32538
N84-33215
FORRESTER, D. L. N84-32706
FORTUNE, M. A. N84-32967
FOSTER, K. T. N84-32975
FOX, G. L. N84-32875
FOZHKOV, A. V. N84-32600
FRADKIN, D. M. N84-33160
FRANK, K. H. N84-32887
N84-32888
FRANKE, M. E. N84-32366
FRAU, B. A. N84-32571
FREAR, D. R. N84-32521
FRENCH, A. P. N84-33337
FRERKING, M. E. N84-32778
FROES, F. H. N84-32512
FUJIMOTO, J. N84-33343
FUJITA, T. N84-32916
N84-32917
N84-32918
FUNADA, K. N84-32587
FURSOV, A. M. N84-32611

G

GABRIEL, C. N84-33343
GAGLIANI, J. N84-32535
GAGLIANI, J., JR. N84-32535
GAHN, R. F. N84-32909
GALLAGHER, H. C., JR. N84-32663
GALLO, A. M. N84-32876
GANDY, C. N84-32614
GANGULI, G. N84-33191
GANNON, D. N84-33059
GAPPOYEV, A. B. N84-32600
GARCIA, L. N84-33193
GARDNER, J. N84-33363
GARG, A. N84-32438
GARNER, F. A. N84-32465
N84-32513
GARNER, H. D. N84-32787
GARRETT, M. F. N84-33359
GASPARYAN, Y. M. N84-32595
GASQUI, J. N84-33049
GAUDRY, G. I. N84-33046
GAVRILIN, I. V. N84-32495
GAYBULLAYEV, S. N84-32600
GAYNOR, C. A. N84-33099
GEIGER, G. N84-33363
GEISLER, R. N84-32561
GENCO, L. V. N84-32795
N84-33188
GENERAZIO, E. R. N84-32849
GENONI, T. C. N84-33164
GEORGE, J. W. N84-33260
GEORGE, M. N84-32572
GEORGE, T. F. N84-33226
GEORGES, T. M. N84-32666
N84-32669
GERMAN, E. S., JR. N84-33279
GHALLA-GORADIA, M. N84-32427
GHODOOSIAN, N. N84-32363
GIBSON, R. B. N84-32817
GILLEN, K. T. N84-32547
GILLHAM, J. K. N84-32452
GIVLER, R. C. N84-32743
GLADSTONE, D. N84-33340
GLADYSHEV, S. A. N84-32499
GLASSER, L. A. N84-33361
GLENN, M. L. N84-32524
GLUCKSTERN, R. N84-32662
GODBILLON, C. N84-33025
N84-33038
GODOWITCH, J. M. N84-32980
GOEBEL, D. M. N84-33202
GOEDERT, J. N84-33196
GOFF, M. F. N84-32650
GOLDBERG, M. N84-33119
GOLDEN, W. G. N84-32454
GOLDFINGER, R. C. N84-33204
GOLDHAR, J. N84-32726
GOLDSCHMIDT, H. N84-33049
GOLDSTEIN, C. I. N84-33111
GOLDSTEIN, R. E. N84-33342
GOLDSTEIN, S. A. N84-33198
GOLOSHCHAPOV, F. A. N84-32482
GOLOVANOV, V. N84-32997
GONZALEZ, C. C. N84-32686
GOODMAN, B. M. N84-32963
GOODYER, M. J. N84-32397
GOORJIAN, P. M. N84-32350
GORDON, M. D. N84-33296
GORDON, W. L. N84-33210
GOREE, J. G. N84-32877
GORENSTEIN, P. N84-33315
GORGOSHIDZE, A. N. N84-32583
GORLOV, N. V. N84-32499
GORODETSKIY, A. V. N84-32601
GOTTBRATH, J. H. N84-32793
GOVAERTS, W. N84-33047
GOWAN, J. G. N84-33177
GRAHAM, J. A. N84-33010
GRAIF, E. N84-33107
GRAND, A. F. N84-32368
GRANKOVSKII, V. I. N84-32747
GRAVES, R. S. N84-32763
GRAY, R. N84-33247
GRAY, R. J. N84-32837
GREATREX, R. N84-32455
GREEN, D. J. N84-32539
GREEN, H. E. N84-32828
GREEN, P. N84-32742
GREEN, R. M. N84-32844
GREENBAUM, S. G. N84-32451
N84-32538
GREENE, J. M. N84-33197
GREENWOOD, N. N. N84-32455
GREGG, C. T. N84-32993
GREGORY, W. S. N84-32769
GREWAL, G. S. N84-32372
GRIFFITH, J. S. N84-32662
GRILL, A. N84-32536
GRIMM, M. J. N84-32831
GRINER, D. B. N84-32805
GROBOV, V. A. N84-32881
GROSJEAN, F. N84-33358
GROSS, B. N84-33025
N84-33038
GU, G. N84-33350
GUBANKOV, V. N. N84-32602
GUBENKO, S. I. N84-32498
GUDIKSEN, P. H. N84-32975
GUERBET, M. N84-33015
GUIAR, C. N. N84-32627
N84-32628
GUILLOT, J. C. N84-33121
GUINAN, J. J. N84-33362
GULLBERG, K. N84-32804
GUNDERMAN, T. N84-32877
GUNZBURGER, M. D. N84-32758
GURSKY, H. N84-33186
GUSEV, V. G. N84-32588
GUSTAFSON, G. N84-32781
N84-32949
GVILDYS, J. N84-32766

H

HAAS, J. E. N84-32368
HABASHY, T. M. N84-33350
HAGEDORN, N. H. N84-32909
HAGGERTY, J. J. N84-33305
HAI, F. N84-32710
HAI, N. X. N84-33026
HAKIMI, F. N84-33355
HALE, J. K. N84-33117
HALE, K. L. N84-33359
HALL, C. N84-32759
HALL, W. B. N84-32829
HALLE, M. N84-33358
N84-33359
HALLEN, D. N84-32561
HALSTEAD, J. N84-32550
HAMBLEN, J. O. N84-33054
HAMILL, P. N84-32952
HAMMER, J. H. N84-32684
HAMPEL, V. E. N84-33099
HANDY, C. R. N84-33195
HARAO, M. N84-32568
HARDY, G. H. N84-32393
HARIHARAN, S. N84-33112
HARMAN, M. W. N84-32614
HARRINGTON, J. A. N84-33185
HARRIS, E. S. N84-32617
HARRIS, J. W. N84-33359
HARRISON, W. N84-32901
N84-32962
HARTMAN, C. W. N84-32664
HARTOP, R. W. N84-32625
HARTZELL, G. E. N84-32366
HARWELL, K. E. N84-32551
HATCH, G. E. N84-33010
HAUCK, C. N84-33361
HAUCKE, H. N84-33243
N84-33244
HAUS, H. A. N84-33343
HAWKINS, S. N84-33358
HAWRYLUK, A. M. N84-33353
HAYDEN, B. P. N84-32973
HAYNES, W. M. N84-33297
HAYWARD, G. N84-33182
HAZLETT, R. N. N84-32553
HEAMES, T. J. N84-32840
HEARLE, J. W. S. N84-32541
HEDIN, R. C. N84-32812
HELLERSTEIN, J. N84-33264
HEMMER, P. R. N84-33344
HENDERSON, F. M. N84-32874
HENESIAN, M. A. N84-32728
HENRICKS, R. J. N84-32504
HERMAN, I. P. N84-32815
HEYWOOD, J. B. N84-33306
HICKS, H. R. N84-33193
HIGBIE, P. R. N84-32954
HILL, C. T. N84-33334
HILLIS, D. L. N84-32559
HINDSON, W. S. N84-32393
HINES, M. N84-33340
HIRSHMAN, S. P. N84-33195
HIZA, M. J. N84-33297
HOCKENSMITH, R. P. N84-32621
HODGE, P. G., JR. N84-32882
HODGE, R. W. N84-32381

HODGKINS, H. L. N84-32551
HOERGER, J. N84-33275
HOERST, D. J. N84-33148
N84-33149
N84-33150
HOFFER, J. K. N84-33232
N84-33233
HOFFMAN, R. W. N84-33210
HOLBERT, R. K., JR. N84-32837
HOLLINGER, J. P. N84-32884
HOLLINS, R. C. N84-32806
HOLLOWAY, F. W. N84-32801
HOLM, R. G. N84-32367
HOLMES, J. A. N84-33193
HOLTRUP, G. N84-33018
HONG, J. N84-33341
HOPPE, D. J. N84-32625
HORA, S. C. N84-33134
HORN, W. J. N84-32377
HORNER, J. L. N84-33187
HORNSTRA, F. N84-32729
HOROWITZ, E. N84-33060
HORWITZ, C. M. N84-33353
HOTZ, A. F. N84-32423
HOUK, R. S. N84-33194
HOVANESSIAN, J. D. N84-32577
HOVEL, H. J. N84-32932
HOWELL, J. R. N84-32770
HOWELL, W. C. N84-32712
HOWELL, W. E. N84-32787
HOYING, P. N84-33326
HUANG, C. Y. N84-33230
HUFFER, F. N84-33130
HUFFMAN, J. P. N84-33276
HUGUS, M. N84-32900
HUMPELER, E. N84-33004
HUMPHREY, J. A. C. N84-32755
N84-32767
HUNG, Y. Y. N84-32577
HUNNI, S. N84-32799
HURD, W. J. N84-32632
N84-32634
HURLEY, K. N84-33332
HURT, W. D. N84-33007
HURTLE, D. E. N84-32714
HUSBANDS, C. R. N84-33175
HWANG, K. K. S. N84-32537
N84-32540
HYDE, R. A. N84-32615
HYMAN, J. M. N84-33122

I

IMAN, R. L. N84-33134
IMBRIALE, W. A. N84-32625
IMSHENETSKIY, A. A. N84-33001
INAMA, K. N84-33004
INDEKEU, J. O. N84-33342
INGALLS, R. L. N84-33237
INGBER, M. S. N84-32745
INGELS, F. M. N84-33097
INGERSOLL, A. P. N84-32948
INJEYAN, H. N84-32813
IONOV, N. P. N84-32592
IPPEN, E. P. N84-33343
IRVINE, R. D. N84-32430
ISHAI, O. N84-32438
ISHIMARU, A. N84-32955
IVERSON, R. W. N84-33278
IVOYLOV, V. F. N84-32596

J

JACOBS, R. E. N84-32417
JAGANNATH, C. N84-33346
JAIN, M. L. N84-32559
JAIN, S. C. N84-32905
JAIN, S. H. N84-33344
JAKOBS, D. M. N84-32857
JAMES, D. R. N84-32724
JANARDAN, B. A. N84-33148
N84-33149
N84-33150
JANIKOWSKY, L. C. N84-32760
JARRELL, J. A. N84-33337
JARRETT, J. R. N84-33269
JAULENT, J. F. N84-33039
JENSEN, B. N84-33248
JESSEN, K. N84-33014
JEZERC, J. J. N84-32537
JHAVERI, S. N84-33363
JOANNOPOULOS, J. D. N84-33336
JOEHNK, J. M. N84-32666
JOHANSON, D. C. N84-32775
JOHNSON, D. H. N84-32929
JOHNSON, D. L. N84-32626
JOHNSON, L. L. N84-33286
JOHNSON, M. E. N84-33135
JOHNSON, R. L. N84-32780
JOHNSTON, J. C. N84-32960
JOLY, P. N84-33121
JONES, D. N84-32578
N84-33266
JONES, R. H. N84-33273
N84-33274
JONES, R. M. N84-32666
N84-32669
JONES, W. N84-32578
JORDON, D. L. N84-32806
JORTNER, J. N84-32542
JUMP, G. A. N84-32455
JUNGMANN, H. N84-33004
JUSEM, J. C. N84-32947

K

KACENJAR, S. T. N84-33190
KAI, K. N84-33326
KALININA, I. G. N84-32489
KALSON, S. N84-33114
KAMENTSKY, L. A. N84-33363
KAMINSKY, Y. N84-32412
N84-32413
KAMPAS, F. J. N84-33236
N84-33246
KANG, S. C. N84-32820
KANTEMIR, I. I. N84-32881
KAPLAN, H. L. N84-32366
KARDAR, M. N84-33342
KARLIN, R. N84-32944
KARPUK, M. N84-32929
KARTELEVA, M. I. N84-32444
KASPRZYK, M. N84-32550
KASS, R. A. N84-33062
KASTNER, M. A. N84-33351
KATOW, S. N84-32627
KAUFFMAN, R. E. N84-32445
KAUFMAN, F. N84-33156
KAUFMAN, M. N84-33342
KAUL, R. N. N84-33092
KAUR, S. N84-33092
KAWAKAMI, S. N84-33343
KAXIRAS, E. N84-33338
KAZAKOV, B. V. N84-32592
KAZAKOV, I. Y. N84-33101
KEITHLEY, E. M. N84-33362
KELLEHER, D. N84-33339
KELLER, R. N84-33093
KELLER, V. W. N84-32398
KELLY, T. P. N84-32532
KELTNER, N. R. N84-32796
KEMP, N. H. N84-32733
KENNEDY, J. M. N84-32877
KENNEDY, R. S. N84-33356
KENNEL, J. M. N84-32777
KENYON, J. W. N84-32835
KERBER, R. N84-32682
KERN, F. A. N84-33279
KETTERSON, J. B. N84-33153
KEYSE, S. J. N84-33359
KEYSER, S. J. N84-33358
KHALYAVKO, P. M. N84-33002
KHAN, M. N84-33360
KHAN, S. N84-32534
KHAN, W. N84-32754
KHARCHENKO, V. A. N84-32483
KHEIFETS, S. N84-33140
KHIZHNIAK, V. G. N84-32474
KHOTUNTSEV, Y. L. N84-32605
KHRAMOV, A. V. N84-32608
KHVOROSTYANOY, Y. I. N84-32583
KIANG, N. Y. S. N84-33362
KIDMAN, R. B. N84-33311
KIERSTEAD, J. N84-33344
KIKUCHI, R. N84-32458
KILGORE, P. D. N84-32793
KIM, J. N84-32753
KIMBALL, C. W. N84-33227
KINDER, T. H. N84-32665
KINDLE, C. H. N84-32579
KING, J. G. N84-33337
KING, R. J. N84-32678
KINOSHITA, K. N84-32930
KIPARSKY, R. P. V. N84-33359
KIPP, H. W. N84-32410
KIRBY, P. B. N84-33241
KIRBY, R. H. N84-33020
KISELMAN, C. O. N84-33033
KLEBESADEL, R. W. N84-33332
KLEPPNER, D. N84-33339
KLETTE, R. N84-33118
KLINE, E. A. N84-32432
KNOTT, P. R. N84-33148
N84-33149
N84-33150
KNOWLTON, T. M. N84-32762
KNYSTAUTAS, R. N84-32463
KOBAYASHI, A. S. N84-32860
KOBAYASHI, W. S. N84-32359
N84-32360
KOBLER, J. B. N84-33362
KOCHETKOV, V. T. N84-33101
KOFSKY, I. L. N84-32957
KOKUSHKIN, I. V. N84-32485
KOLESNIKOV, S. Y. N84-32473
KOLIWAD, K. M. N84-32911
KOLMOGOROV, G. L. N84-32822
KOLOMOYTSEV, V. F. N84-32610
KON, Y. L. N84-32591
KONG, J. A. N84-33350
KONKOV, E. A. N84-32860
KONOVALCHUKOV, A. G. N84-32487
KONYSHEV, V. P. N84-32501
KOO, K. P. N84-32794
KORNACKI, A. S. N84-33318
KOROLKOV, V. I. N84-32600
KORTAN, A. R. N84-33341
KOSCIELSKI, C. G. N84-32643
KOSHIBA, M. N84-32540
KOSUGI, T. N84-33326
KOTLARCHYK, M. N84-33352
KOTSERZHINSKIY, B. A. N84-32603
N84-32606
KOUKOS, J. N84-32648
KOURTIDES, D. A. N84-32431
KOUSKY, V. E. N84-32963
KOWALSKI, B. R. N84-32466
KOYUNCU, Y. N84-32632
KOZLOV, Y. M. N84-33101
KOZLOVA, T. M. N84-33001
KOZLOWSKI, G. N84-33230
KOZYREV, A. B. N84-32604
KRAUS, J. N84-33189
KREHBIEL, P. N84-32788
KREINDLER, E. N84-32394
KREPCHIN, I. N84-33304
KRETSCHMER, F. F., JR. N84-32674
KRIVOLAPOVA, L. T. N84-33104
KROEGER, J. N84-32677
KROMREY, R. V. N84-32434
KRYS, V. Y. N84-32610
KRYZHANOVSKIY, V. L. N84-32589
KUCERA, G. H. N84-32549
KUECHER, G. N84-32901
KUFELD, R. M. N84-32381
KULIKOV, N. I. N84-32480
KUMAR, P. N84-33355
KUMAR, S. N84-33345
KUNATH, R. R. N84-32789
KUNIGAHALLI, V. N84-32534
KUNIMATSU, K. N84-32454
KUNISCH, K. N84-33107
KUPKA, I. N84-33025
N84-33038
KUZIN, N. N. N84-32526
KUZMIN, P. P. N84-32601
KUZNETSOV, A. T. N84-32485
KYHL, R. L. N84-33348
N84-33349

L

LACKEY, W. J. N84-32518
LADERMAN, A. J. N84-32811
LAGALLY, M. G. N84-33239
LAGERLOEF, G. S. E. N84-32988
LAKIN, C. T. N84-33171
LAMBARSKI, T. J. N84-32689
LANDKOF, M. N84-33247
LANDOLT, J. P. N84-33016
LANG, J. H. N84-33349
LANGE, F. F. N84-32539
LANGEL, R. A. N84-32895
LANSING, F. L. N84-32629
N84-32910
LANYI, G. N84-32636
LAPEYRE, G. J. N84-33223
LAROS, J. G. N84-33332
LARSEN, M. E. N84-32770
LARSON, B. D. N84-33345
LARSON, T. J. N84-32384
LASHUK, V. S. N84-32497
LAST, I. N84-33226
LAUNDER, B. E. N84-32755

LAWSON, A. C. N84-32921
N84-32922
LAWSON, A. G. N84-32827
LEATHERMAN, S. P. N84-32987
LEBEDEV, I. V. N84-32609
LEE, D. H. T. N84-33338
LEE, D. J. N84-32399
LEE, E. H. N84-32522
LEE, E. P. N84-33159
LEE, J. C. N84-32716
LEE, J. H. N84-32463
LEE, J. K. N84-32509
LEE, J. M. N84-32752
LEE, M. B. N84-33340
LEE, P. L. N84-33347
LEE, S. W. N84-32645
LEECH, C. M. N84-32541
LEGRAND, A. N84-33050
LEIFFER, J. L. N84-32532
LEIGHTON, T. N84-32713
LENGEL, R. H. N84-33293
LENK, R. J. N84-33342
LENTZ, W. D. N84-32676
LEONOV, V. V. N84-32592
LEONTEV, Y. A. N84-32495
LERAT, B. N84-32847
LESTER, L. N. N84-33058
N84-33072
LETTVIN, J. Y. N84-33363
LEUNG, K. N. N84-33192
LEV, I. E. N84-32486
LEVY, A. V. N84-33247
LEVY, P. W. N84-32457
LEVY, R. N84-32624
LEWIS, B. L. N84-32674
LI, T. C. N84-32556
LIDSKY, L. M. N84-33354
LIEN, M. K. N84-32791
LIEPINS, G. E. N84-33089
LIEUTENANT, J. L. N84-33031
LIGARE, M. N84-33339
LIM, J. S. N84-33357
LIMA, U. M. B. N84-33073
LIN, C. L. N84-33352
LIN, P. C. N84-32906
LIN, S. B. N84-32537
N84-32540
LIN, X. B. N84-33117
LINCE, J. R. N84-33224
LINDEN, K. J. N84-32802
LINDSEY, W. C. N84-32646
N84-32647
N84-32648
LIPMAN, R. R. N84-32874
LIROVA, S. A. N84-32998
LITSTER, J. D. N84-33345
LITTLEFIELD, R. J. N84-33090
LIU, H. W. N84-32503
LIU, K. N84-32404
LIU, T. Y. N84-32380
LIU, W. H. N84-33078
LO, R. C. N84-32984
LO, Y. T. N84-32645
LOBAO, D. C. N84-32409
LORENZ, J. H. N84-33213
LORIA, J. C. N84-32426
LOSKUTOV, V. F. N84-32474
LOWERY, G. B. N84-32638
LOWERY, R. L. N84-32650
LUCAS, D. N84-32459
LUCKE, R. L. N84-32792
LUDWICK, J. D. N84-32579
LUKENS, F. E. N84-32680
LUSTMAN, L. N84-33113
LUTES, G. F. N84-33179
LUTWACK, R. N84-33213
LYALL, V. N84-33092
LYNCH, J. N84-33132
LYNN, C. W. N84-33360
LYONS, T. J. N84-33043
LYSENKO, S. V. N84-33001
LYYRA, A. M. N84-33339

M

MA, D. C. N84-32766
MABEY, D. G. N84-32379
MACAYEAL, D. R. N84-32950
MACKLIN, S. A. N84-32903
MADAN, S. N84-33042
MADAVAN, N. K. N84-32756
MADDUX, A. S. N84-32845
MAEDA, M. W. N84-33355
MAENO, Y. N84-33243
N84-33244
MAGNUSSON, H. G. N84-32650
MAJOR, W. R. N84-32923
MALECHA, R. F. N84-32722
MALGRANGE, B. N84-33025
N84-33036
MALYSHEV, I. V. N84-32607
MALYUCHKOV, O. T. N84-32480
MAMEDOV, M. B. N84-32487
MANCINI, F. N84-33230
MANKA, C. K. N84-33190
MANTEUFFEL, T. A. N84-33122
MAPLE, M. B. N84-33230
MARCHENKO, Y. N. N84-33104
MARCHERTAS, A. N84-32570
MARCUS, M. N84-33119
MARINESCU, P. N84-32362
MARINOS, C. N84-32425
MARK, J. W. K. N84-33159
MARK, M. B. N84-33355
MARSH, R. A. N84-32908
MARSHALL, F. E. N84-33333
MARSHALL, H. A. N84-32697
MARSHALL, S. E. N84-33145
N84-33146
MARTINET, J. N84-33025
N84-33038
MARTINEZ-MIRANDA, L. J. N84-33341
MARTYSHEVSKIY, Y. V. N84-32613
MARZIALE, M. L. N84-32751
MASON, T. O. N84-33242
MASSEY, D. W. N84-33198
MASTIN, C. W. N84-33105
MATEJCZYK, D. N84-32662
MATHESON, L. D. N84-32665
MATHIEU, J. B. N84-32488
MATLOCK, D. K. N84-32517
MATSUMOTO, H. N84-33230
MATTOX, D. M. N84-32614
MATUSHKIN, N. N. N84-32591
MAULDIN, J. N84-33097
MAXWELL, T. A. N84-33319
MAY, M. N84-32373
MAYLE, R. E. N84-32751
MAZARAKIS, M. G. N84-33163
N84-33164
MCALLISTER, P. R. N84-33255
N84-33256
MCCARTY, R. D. N84-33297
MCCOOL, H. I. N84-32841
MCCREARY, J. N84-32991
MCCUNE, J. E. N84-33354
MCDONALD, R. N. N84-32453
MCDUFF, G. N84-32818
MCELROY, D. L. N84-32763
MCGEHEE, J. R. N84-32378
MCGONIGAL, M. N84-33340
MCKAY, M. D. N84-33136
MCKAY, S. R. N84-33342
MCLEARY, R. N84-32803
MCMASTER, L. R. N84-32952
MCMILLIN, C. R. N84-32798
MCNAIR, A. N84-32534
MCWILLIAMS, B. M. N84-32815
MEEKER, D. N84-32664
MEEKINS, J. F. N84-33186
MEINGAILIS, J. N84-33353
MELLENBRUCH, L. L. N84-32676
MELNIKOVA, V. V. N84-32483
MENENDEZ, A. N. N84-32773
MENOWN, H. N84-32818
MENU, J. P. N84-33017
MERAKOS, L. N84-32616
MERKEY, P. N84-32641
MERKLE, C. L. N84-32756
MERRILL, R. G. N84-32665
MERTEN, C. W. N84-32886
MESHCHANOV, V. P. N84-32587
MESITE, P. L. N84-33355
MESZAROS, S. P. N84-33320
METELNIKOVA, I. V. N84-32587
METTING, N. F. N84-32791
MEYER, F. N84-32879
MEYER, H. R. N84-32562
MEYER, R. E. N84-33344
MEYER, R. G. N84-32709
MEZZINA, A. N84-32456
MIKKELSON, D. C. N84-32344
MIKROYANNIDIS, J. A. N84-32431
MILES, C. R. N84-32923
MILLEN, E. W. N84-32383
MILLER, A. H. N84-32772
MILLER, D. E. N84-32742
MILLER, D. G. N84-32672
MILLER, D. W. N84-32734
MILLER, F. J. N84-33009
MILLER, G. I. N84-33055
MILLER, G. R. N84-32959
MILLER, J. M. G. N84-32939
MILLER, M. M. N84-32572
MILLER, R. B. N84-32400
N84-33164
MILLER, R. M. N84-33163
MIMMACK, G. N84-33132
MINZHONG, Z. N84-32509
MIRTICH, M. J. N84-32425
MISEL, J. E. N84-32872
MISHINA, H. N84-32531
MITCHELL, G. A. N84-32344
MITLITSKY, F. N84-32815
MITSKEVICH, N. S. N84-32486
MIYOSHI, K. N84-32508
MIZIN, V. G. N84-32444
MIZUMOTO, C. N84-33552
MIZUTA, Y. N84-33030
MOCHRIE, S. G. J. N84-33341
MOEN, I. O. N84-32463
MOERDER, D. D. N84-33071
MOGILEVSKII, V. M. N84-32525
MOGK, D. W. N84-32940
MOHR, G. C. N84-33013
MOIN, P. N84-32753
MOLLOW, B. R. N84-33344
MON, G. R. N84-32660
MONAHAN, R. H. N84-32545
MONDT, J. P. N84-33196
MONES, E. T. N84-32548
MONEY, K. E. N84-33016
MONSON, C. B. N84-32989
MOOK, D. R. N84-33357
MORAN, W. M. N84-32667
MORELL, L. J. N84-33081
MORGAN, J. A. N84-33178
MORGAN, R. J. N84-32548
MORGENTHALER, F. R. N84-33348
MORRISEY, E. J. N84-32376
MORRISON, R. J. N84-33181
MOSHER, D. N84-33289
MOSIN, E. F. N84-32485
MOSKOWITZ, P. N84-33339
MOSTAGHIMI, J. N84-33203
MOURA, A. D. N84-32899
MOVSESYAN, R. M. N84-32595
MUENCH, H. S. N84-32971
MULLIN, J. P. N84-32426
MUSHRUSH, G. W. N84-32553
MUSICUS, B. R. N84-33357
MUSTEL, Y. R. N84-32569
MYSHLYAEV, L. P. N84-33104

N

NAEGELI, D. W. N84-32933
NAIDIC, J. V. N84-32492
NAIK, R. V. A. N84-32436
NAKAJIMA, H. N84-33326
NAMAZOV, S. A. N84-32585
NAUMANN, R. J. N84-32569
NEALE, C. N84-32818
NEHL, T. W. N84-32707
NEIGHBOURS, J. R. N84-32657
N84-33155
NELSON, G. N84-33329
NELSON, H. G. N84-32438
NELSON, J. G. N84-32775
NENNO, S. B. N84-32872
NEUMAIER, P. N84-32848
NEUMAN, F. N84-32394
NEWMAN, J. N84-32731
NEWMAN, J. S. N84-33151
NEWTON, R. E. N84-32970
NGAI, K. L. N84-32851
N84-33250
NGUYEN, T. T. N84-33355
NICHOLS, R. L. N84-32829
NIEL, M. N84-33332
NIKITIN, V. G. N84-32600
NISHIDA, O. N84-32478
NIX, R. P. N84-33070
NOEL, G. T. N84-32690
NOGUCHI, S. N84-32567
N84-32568
NOLA, F. J. N84-32913
NORMAN, E. B. N84-33335
NORRIS, J. P. N84-33331
NOUFI, R. N84-32926
NOVICHKOVA, A. T. N84-33001
NUNNALLY, W. C. N84-32725
NUSSBAUM, P. N84-32781
N84-32949

O

OCKO, B. M. N84-33341
ODA, S. N84-33351
OGANESYAN, M. G. N84-32595
OHTAGURO, Y. N84-32566
OKAZAKI, Y. N84-32727
OLDANI, J. J. N84-33099
OLIVASTRO, D. N84-33255
N84-33256
OLSEN, R. B. N84-32396
OLSON, C. E. N84-33230
OLSON, D. L. N84-32517
O'MALLEY, M. W. N84-32461
OMEDINA, S. O. N84-33258
OPPENHEIM, A. K. N84-32459
OPPENHEIM, A. V. N84-33357
ORTEGA, J. M. N84-33056
OSBORNE, L. N84-33259
OSSAKOW, S. L. N84-33191
OSTEN, D. W. N84-32466
OTT, W. R. N84-32797
OTVOS, J. W. N84-33327
OULID-AISSA, M. N84-33265
OVERTON, J. H., JR. N84-33009
OVERTON, W. C., JR. N84-32515
N84-33245
OWENS, E. C., JR. N84-32833
OWYOUNG, A. N84-32460
OZAKI, T. N84-32478

P

PACE, M. O. N84-32724
PADILHA, A. L. N84-32898
PAISAN, L. N84-32568
PALUMBO, J. J. N84-32775
PAMIDI, P. R. N84-32866
N84-32868
PANAMAREV, V. A. N84-32861
PANCHAL, C. B. N84-32771
PANOFSKY, W. K. H. N84-33165
PARK, J. E. N84-32765
PARK, W. T. N84-32345
PARSHIN, V. S. N84-32597
PARSI, E. J. N84-32471
PARTLOW, D. P. N84-32814
PARYGIN, V. N. N84-32599
PASCHEN, K. W. N84-32710
PASKO, T. J., JR. N84-32578
PASS, J. D. N84-32687
PASTOR, A. C. N84-33165
PASTRNAK, J. W. N84-32816
PATE, B. B. N84-33234
PATIL, S. A. N84-33131
PATRICK, M. G. N84-33166
PAUL, W. N84-33241
PAWLIKOWSKI, E. N84-32731
PAZYUK, M. Y. N84-32747
PEAKE, W. T. N84-33362
PEARSON, A. W. N84-33235
PEARSON, P. H. O. N84-32969
PEASE, C. H. N84-32903
PEDERSON, D. O. N84-32709
PELISCHEK, T. E. N84-32424
PELLEGRINI, C. N84-33154
PELLIN, R. N84-33213
PENDERGRAFT, O. C., JR. N84-32354
PENFIELD, P., JR. N84-33361
PENKO, P. F. N84-32425
PEPELOV, A. A. N84-32479
PERDRIEL, G. N84-33019
PERLMAN, D. N84-33363
PERMINOV, A. A. N84-32496
PETERS, M. N84-32682
PETERSON, D. B. N84-32916
N84-32917
PETERSON, E. N84-33279
PETERSON, E. A. N84-32742
PETERSON, J. S. N84-32756
PETERSON, R. N84-32459
PETROV, G. V. N84-32606
PETROVA, N. I. N84-32528
PEUSE, B. W. N84-33344
PFEIFFER, P. N84-32570
PHILLIPS, P. J. N84-32548
PHILPOTT, M. R. N84-32454
N84-33184
PHOENIX, S. L. N84-32441
PICARD, L. N84-33360
PICKETT, H. M. N84-32448
PIERCY, B. W. N84-32834
PIERRE, M. N84-33034
PIERZGA, M. J. N84-32357
PIKUNOV, M. V. N84-32497
PISMEROV, O. B. N84-32596
PISZCZOR, M. F., JR. N84-32427
PITZ, W. J. N84-32467
N84-32844
PLANTE, J. F. N84-33028
PLATONOV, M. N. N84-32592
PLEASANT, L. G. N84-32990
PLOTKIN, G. M. N84-33363
PLUZHNIKOV, A. D. N84-32590
POBORIL, F. N84-32477
POENARU, V. N84-33025
N84-33038
POIRIER, N. C. N84-32419
POLISHCHUK, I. M. N84-32581
POLIYEVSKIY, G. A. N84-32595
PONIKVAR, D. R. N84-33344
POOL, K. H. N84-32579
POPEL, S. I. N84-32496
PORKOLAB, M. N84-33354
PORSCHING, T. N84-32759
POSNER, E. C. N84-32622
N84-32641
POST, R. F. N84-33201
POUKEY, J. W. N84-33164
POULIN, E. N84-33304
POWELL, P. N84-33365
POWELL, S. H. N84-32828
POYNTER, R. L. N84-32448
PRASAD, V. N84-32744
PRATO, T. A. N84-32471
PRAVER, G. N84-32920
PRICE, A. O. N84-33148
N84-33149
N84-33150
PRITCHARD, D. E. N84-33339
PROSCHAN, F. N84-33132
PROSCIA, W. M. N84-32467
PROULX, P. N84-33203
PRZEKWAS, A. J. N84-32428
N84-32429
PUGMIRE, R. J. N84-32552
PUSTER, R. L. N84-32447
PUSTINGER, J. V. N84-32796

Q

QADER, S. A. N84-32912
QUINLAN, K. P. N84-33218
N84-33229
QUINN, R. K. N84-32732
QUINT, B. E. N84-33286

R

RABE, K. N84-33338
RADCHENKO, A. F. N84-32607
RADOSEVICH, J. D. N84-33266
RAJAGOPAL, A. K. N84-32851
N84-33250
RAJESWARAN, G. N84-33246
RAM-MOHAN, L. R. N84-33346
RAMAKRISHNAN, I. V. N84-33079
RAMAPRIAN, B. R. N84-32773
RAMULU, M. N84-32880
RAND, S. C. N84-33185
RANKIN, M. N84-32800
RAO, B. C. S. N84-32825
RAQUET, C. A. N84-32789
RASHLEIGH, S. C. N84-33174
RATCLIFFE, C. A. N84-32791
RAYMOND, S. A. N84-33363
REDDY, S. M. N84-33061
REDER, L. J. N84-32632
REDEY, L. N84-32720
N84-32730
N84-32741
REDIKER, R. H. N84-33355
REED, I. S. N84-32633
REED, M. J. N84-32902
REEDY, R. C. N84-33321
REEVES, C. R. N84-32761
REIF, L. R. N84-33216
REINGRUBER, J. K. N84-32551
RENZETTI, N. A. N84-32403
REPLOGLE, K. K. N84-33306
REUTOVA, N. P. N84-32500
REYNOLDS, R. M. N84-32903
REYX, C. N84-32647
REZNICK, S. G. N84-32386
RHINE, W. E. N84-32445
RICHARDSON, R. W. N84-32740
RICKELY, E. J. N84-33151
RICKETS, R. H. N84-32348
RICKETTS, C. I. N84-32769
RIDDLE, E. P. N84-33261
RIEWE, A. A., JR. N84-32637
RILEY, J. P. N84-32668
N84-32669
RILEY, M. J. N84-32715
RIVA, G. N84-32554
RIVEST, R. N84-33361
ROBBEN, F. N84-32464
ROBERTO, J. B. N84-33199
ROBERTS, D. H. N84-33349
ROBERTSON, D. E. N84-32579
ROBERTSON, G. D., JR. N84-33209
ROBERTSON, R. E. N84-32701
ROBINSON, C. E. N84-32734
ROBINSON, P. A., JR. N84-33211
ROBWEIN, G. J. N84-32735
ROCK, M. N84-32534
RODERICK, W. I. N84-33152
RODRIGUEZ, G. P. N84-32734
ROEDER, A. W. N84-32659
ROESLER, J. F. N84-32906
ROGERS, J. N84-32682
ROGERS, J. W., JR. N84-32558
ROGERS, W. R. N84-32366
ROLFE, S. T. N84-32883
ROLPH, J. E. N84-33124
RONCHETTI, E. N84-33125
N84-33126
N84-33127
ROPIY, A. I. N84-32612
ROSALES, R. J., JR. N84-33252
ROSCHKE, E. J. N84-32915
ROSEN, D. N84-32698
ROSENBERG, A. N84-32713
ROSENFELD, A. N84-33098
N84-33118
ROSENKRANZ, P. W. N84-33349
ROSENTHAL, S. J. N84-33337
ROSS, J. R. N84-33359
ROSS, R. G., JR. N84-32684
N84-32691
ROSSI, L. N84-32475
RUMBURG, J. P. N84-32687
RUPPEL, I. N84-32550
RUSSELL, J. A. N84-32661
RUSSELL, J. W. N84-32619
RUSSELL, M. D. N84-32632
RUST, K. N84-32818
RUYACABA-RUIZ, D. N84-32890
RYAN, R. E. N84-32403

S

SAAMOILENKO, Z. A. N84-32483
SABA, C. S. N84-32445
SAEKS, R. N84-33102
SAENGER, K. L. N84-33339
SAKR, N. S. N84-33206
SALZMAN, G. C. N84-32993
SAMMS, R. W. N84-32784
SAMSETH, J. N84-33345
SAMSONOV, Y. S. N84-32860
SANDELL, N. R., JR. N84-33133
SANDFORD, M. C. N84-32348
SANTRAKUL, K. N84-32670
SANTUCCI, G. N84-33017
N84-33019
SAPOZHNIKOV, S. Z. N84-32479
SARKARIA, K. S. N84-33027
SATO, H. N84-32458
SATYANARAYANA, P. N84-33191
SAUER, R. A. N84-32762
SAUNDERS, A. N84-32644
SAVAGE, C. H. N84-32921
SAVCHENKO, V. V. N84-32590
SCALES, W. N84-32412
N84-32413
SCHAEFFER, J. R. N84-33314
SCHETZINA, J. F. N84-33214
SCHLIE, L. A. N84-32810
SCHLITT, L. G. N84-33157
SCHMERLING, E. R. N84-33271
SCHMIDT, R. F. N84-32679
SCHNEIDER, E. M. N84-32407
SCHNETZLER, C. C. N84-32895
SCHOCK, R. N. N84-32723
SCHONFELD, D. N84-32638
SCHRAM, E. P. N84-33219
SCHREIBER, W. F. N84-33360
SCHROEDER, W. N84-33093
SCHROETER, K. N84-32493
SCHULSON, E. M. N84-32519
SCHULTZ, L. D. N84-32665
SCHUTZ, B. E. N84-33316

SCHWALLER, M. N84-32689
SCHWARTZ, D. R. N84-32712
SCHWARTZ, M. N84-32364
SCHWEITZER, G. N84-32879
SCHWERING, F. K. N84-32717
SCULLIN, V. J. N84-32446
SEARS, R. G. N84-33157
SEELEY, R. M. N84-33068
SEGERFELDT, J. N84-33144
SEIDEL, D. A. N84-32348
N84-32353
SEKI, H. N84-32454
SELCUK, M. K. N84-32918
SEMERCAN, A. A. N84-32526
SETSER, D. W. N84-32453
SFEIR, R. N84-32634
SHAFFER, L. E. N84-33287
SHAKURSKIY, V. K. N84-32594
SHALIMOV, A. P. N84-32660
SHAMPINE, L. F. N84-33123
SHANK, D. E. N84-32405
SHANKLAND, T. J. N84-32723
SHAO, M. N84-33349
SHAPIRO, J. H. N84-32651
N84-33355
SHAPIRO, N. Z. N84-33284
SHARIFOVA, S. F. N84-32487
SHARP, G. R. N84-32783
N84-32789
SHEFFLER, K. D. N84-32504
SHENOY, R. N. N84-32507
SHEPARD, N. F., JR. N84-32688
SHER, A. N84-33221
SHERMAN, C. N84-32958
SHERSHNEV, A. A. N84-32485
SHEU, E. N84-33352
SHIMOTAKE, H. N84-32722
SHIRATORI, N. N84-32567
SHIRINYAN, P. A. N84-32595
SHNITNIKOV, A. S. N84-32609
SHOPE, S. L. N84-33163
N84-33164
SHROBE, H., JR. N84-33361
SHUART, M. J. N84-32435
SHUEN, J. S. N84-32390
SIA, E. B. N84-33356
SIEBERT, W. M. N84-33362
SIEGEL, G. H. N84-32794
SIEGMAN, A. E. N84-32809
SILO, A. E. N84-32527
SILVA, G. N84-32850
SIM, J. W. N84-32549
SIMBURGER, E. J. N84-32695
SIMON, R. S. N84-33183
SIMONSON, R. J. N84-33340
SINGH, A. K. N84-33005
SINGH, J. J. N84-32437
N84-32447
N84-32786
SINGH, V. N84-32941
SINGH, V. P. N84-32904
SINGHAL, A. K. N84-32426
N84-32429
SINHA, D. N. N84-33232
N84-33233
SISTLA, A. N84-33096
SKANDALIS, G. N84-33036
SKELTON, R. E. N84-32423
SKERJANEC, R. E. N84-33069
SLEDGE, F. R. N84-32746
SLINEY, J. G., JR. N84-32421
SLOWEY, J. W. N84-32965
SLUDER, R. B. N84-32957
SMAGA, J. A. N84-32545
SMALLEY, R. E. N84-32516
SMELTZER, C. E. N84-32575
SMIALOWICZ, R. J. N84-33008
SMITH, D. L. N84-32843
N84-33163
SMITH, H. D. N84-32814
SMITH, H. I. N84-33353
SMITH, I. D. N84-33157
SMITH, J. L. N84-32549
N84-33299
SMITH, J. R. N84-32844
SMITH, N. N84-33339
SMITH, P. R. N84-32769
SMOKLER, M. I. N84-32703
SMOOTZ, E. R. N84-33062
SMULLIN, L. D. N84-33354
SNYDER, C. E., JR. N84-32529
SNYDER, L. N84-33065
SOKOLOV, A. N. N84-33207
SOKOLOV, D. P. N84-32998
SOKOLOVA, Y. A. N84-32998
SOKOLOVSKIY, I. I. N84-32610
SOLBERG, J. L. N84-32990
SOLEM, J. C. N84-33066
SOLIMAN, M. S. A. N84-32472
SOLODOV, Y. S. N84-32609
SOLOMON, A. S. P. N84-32390
SOLOMON, L. E. N84-33345
SONDERGAARD, N. A. N84-32831
SONE, H. N84-32566
SOOD, M. N84-32901
N84-32962
SOVEY, J. S. N84-32425
SOWDERS, L. N84-32991
SPECHT, E. N84-33341
SPECKHARD, T. A. N84-32537
N84-32540
SPENCER, J. H. N84-33183
SPENCER, P. K. N84-32943
SPENCER, R. N84-32685
N84-32700
SPRINKLE, D. R. N84-32786
SPRUNT, S. N84-33345
ST.CLAIR, T. I. N84-32532
ST.CLAIR, T. L. N84-32437
STAELIN, D. H. N84-33349
STALLARD, B. W. N84-32663
STAROSTENKOV, M. D. N84-32499
STARR, R. N84-33325
STATHIS, J. H. N84-33351
STECKER, F. W. N84-33317
STEFANISHIN, Y. I. N84-32589
STEGER, J. L. N84-32358
STEINLE, F. W., JR. N84-32379
STEVENS, A. P. N84-32563
STEVENS, G. L. N84-32623
STEVENS, K. N. N84-33358
STEVENS, R. N84-32639
N84-32640
STEVENSON, L. E. N84-32374
N84-33164
STEVENSON, M. R. N84-32982
STEWART, H. B. N84-32764
STEWART, W. F. N84-32557
STINE, W. B. N84-32919
STIRGUS, M. N84-32985
STOCKTON, R. J. N84-32708
STOFAN, A. J. N84-32411
STOLLER, F. W. N84-32629
STOLTE, W. J. N84-32696
STOLYAROV, S. N. N84-32586
STONE, A. D. N84-33338
STONE, D. N84-32625
STONE, E. W. N84-32625
STOOPS, W. E., JR. N84-32532
STOREY, R. N84-32615
STRAM, H. N84-33343
STRANO, R. F. N84-32871
STRANGE, R. R. N84-32790
STRAUB, P. N84-32535
STRAWN, R. C. N84-32360
STREETT, W. B. N84-32560
STROBEL, J. E. N84-32798
STUART, T. A. N84-32678
STUCHLY, M. A. N84-32992
STUCHLY, S. S. N84-32992
STURCHIO, N. C. N84-32942
SU, Y. T. N84-32648
SUBUDHI, M. N84-32884
SURAMPUDI, S. P. N84-32351
SURANYI, P. N84-33170
SUSA, T. A. N84-32471
SUSSMAN, G. J. N84-33361
SUTKOVOY, D. A. N84-33002
SUTTON, M. N84-33341
SWAFFORD, T. W. N84-32346
SWANSON, A. N84-33272
SWANSON, L. N84-32635
SWEENEY, D. W. N84-32663
SWITZER, W. G. N84-32366

T

TABAK, V. Y. N84-33000
TABOADA, J. N84-33176
TADMOR, E. N84-33053
N84-33108
TAFTO, J. N84-33246
TAKAGI, T. N84-32566
TAKAHASHI, D. N84-32872
TAKAHASHI, K. N84-32567
TALBERT, L. R. N84-33284
TALBOT, L. N84-32464
TAM, L. T. N84-32428
N84-32429
TAMBORSKI, C. N84-32529
TANG, P. K. N84-32769
TANG, S. L. N84-33340
TANNO, K. N84-32478
TANTON, N. E. N84-32615
TARAMENKO, V. P. N84-32603
TARASOV, M. A. N84-32602
TARASOVA, I. L. N84-32601
TASK, H. L. N84-32795
N84-33188
TASKA, J. N84-32663
TAYLOR, P. T. N84-32895
TEAGUE, W. N84-32985
TEEGARDEN, B. J. N84-33332
TEICHERT, W. P. N84-32432
TEITLER, S. N84-32851
N84-33250
THAYER, E. B. N84-32392
THIBAULT, P. A. N84-32463
THOMAS, L. D. N84-33076
THOMAS, R. E. N84-32736
THOMAS, R. J. N84-33325
THOMPSON, C. V. N84-33353
THOMPSON, J. D. N84-32514
THOMPSON, J. F. N84-33105
THOMPSON, R. B. N84-32652
THRASHER, R. K. N84-32637
TICHOVOLSKY, E. J. N84-32652
TIDMAN, D. A. N84-33198
TIKHONOV, S. S. N84-32500
TIMMERMAN, N. S. N84-32440
TISLENKO, V. I. N84-32613
TISUE, M. N84-32901
N84-32962
TKACHENKO, T. V. N84-32500
TOBIAS, C. A. N84-32995
TONG, T. W. N84-32783
TORABI, A. N84-33248
TORRES, W. F. J. N84-32905
TOTSCH, J. P. N84-33288
TRAN, K. T. N84-33080
TRAUB, W. A. N84-32951
TRAUTNER, S. N84-33014
TRAXLER, M. R. N84-32403
TRIMARCHI, P. A. N84-32783
TROISI, V. J. N84-32896
TROWBRIDGE, C. A. N84-32956
TROXEL, D. E. N84-33360
TRUNK, G. V. N84-33129
TRUONG, T. K. N84-32633
TRUSTY, G. L. N84-32972
TSAI, S. N84-32901
TSANG, L. N84-33350
TSAREGORODTSEV, A. I. N84-32499
TSAY, S. Y. N84-32537
N84-32540
TSIBIN, I. P. N84-32485
TUKALO, E. N. N84-32473
TUMMILLO, A. F. N84-32721
TURKEL, E. N84-32349
N84-33111
TUROVTSEV, G. V. N84-32747
TURPIN, R. N84-33077

U

UMAR, A. N84-33261
UMEZAWA, H. N84-33230
UNNAM, J. N84-32505
N84-32506
N84-32507

V

VAIDYANATHAN, K. V. N84-33222
VANALLEN, J. A. N84-32406
VANDALSEM, W. R. N84-32356
VANDEGRIFT, R. E. N84-32667
VANELST, H. C. N84-32475
VANIER, P. E. N84-33236
N84-33246
VANLOON, H. N84-32977
VANROSENDALE, J. N84-33059
VANWINKLE, T. L. N84-32553
VARENKOV, A. N. N84-32482
VARMA, R. N84-32739
VARMAN, P. J. N84-33079
VAROPOULOS, N. T. N84-33025
N84-33038
N84-33051
VAUGHAN, O. H., JR. N84-32788
VAUGHN, R. L. N84-32924
VEDRENNE, G. N84-33332
VENDIK, O. G. N84-32604
VERBURGT, P. W. N84-32418
VERDON, J. M. N84-32355

VERWEST, B. J. N84-33161
VICKROY, J. G., JR. N84-33094
VIGUE, J. P. N84-33044
VILLAGRA, H. M. I. N84-32982
VILLANUCCI, D. P. N84-32957
VILROTTER, V. A. N84-32620
VINZ, F. L. N84-33076
VINMANI, Y. P. N84-32576
VISHWANATH, P. S. N84-32576
VISSERS, D. R. N84-32741
VLADIMIROV, L. P. N84-32481
VLAHINOS, A. N84-32853
VO, G. D. N84-32830
VOGL, O. N84-32530
VOLKMER, K. N84-32920
N84-32922
VONNEGUT, B. N84-32766
VORONEV, G. M. N84-32496
VOSS, S. N84-33169
VOSTRIKOV, V. A. N84-33000
VYKUKAL, H. C. N84-33021
VYSTAVKIN, A. N. N84-32902

W

WACKS, K. P. N84-33360
WAGNER, S. S. N84-33356
WAHLEN, A. N84-32821
WALCH, S. N84-32502
WALDEN, D. C. N84-32665
WALKER, D. N84-33304
WALKER, S. N84-32437
WALLACE, J. S. N84-32544
WALLQUIST, D. L. N84-33006
WANG, H. Z. N84-33350
WANHAINEN, J. S. N84-32783
WARD, F. N84-33006
WARD, J. N84-33360
WARD, M. E. N84-32575
WARD, S. A. N84-32463
WARNOCK, S. N84-33346
WARRICK, J. C. N84-32367
WATERMAN, A. N84-32653
WATKINS, V. E., JR. N84-32532
WATSON, J. J. N84-32348
WEAVER, F. J. N84-32763
WEAVER, H. J. N84-32816
WEAVER, R. L. N84-32896
WEBB, R. C. N84-33167
WEBER, J. M. N84-32360
WEBSTER, C. W. N84-32719
WEGLEY, H. L. N84-32772
N84-32914
WEGNER, G. A. N84-33310
WEI, G. C. N84-32442
WEINSCHEL, H. D. N84-32653
WEINSTOCK, H. N84-33245
WEISS, I. N84-32512
WEISS, T. F. N84-33362
WEITZNER, H. N84-33204
WELLMAN, G. W. N84-32863
WELLS, J. D. N84-33063
WESTBROOK, C. K. N84-32463
N84-32467
N84-32844
WETHERHOLD, R. C. N84-32433
WHALEY, A. D. N84-33087
WHEATLEY, J. C. N84-33243
N84-33244
WHEELER, T. P. N84-32419
WHITCOMB, J. D. N84-32439
WHITE, M. A. N84-32647
WHITEHAIR, S. N84-32682
WHITEHEAD, J. C. N84-32815
WHITEHEAD, J. P. N84-33230
WHITMORE, S. A. N84-32384
WICK, R. V. N84-32779
WIDEN, A. N84-32604
WIEDERHOLD, D. A. N84-33253
WIEDERHOLD, G. C. M. N84-33091
WIELENGA, T. J. N84-32855
WIEMANN, H. J. N84-32562
WIESNER, S. N84-33363
WIGGINS, C. P. N84-32640
WILBY, E. G. N84-33147
WILBY, J. F. N84-33147
WILEMSKI, G. N84-32733
WILLETT, H. F. N84-33171
WILLIAMS, B. N84-33116
WILLIAMS, E. N84-33066
WILLIAMS, R. S. N84-33224
WILLIAMS, S. D. N84-32414
N84-32416
WILLIS, J. C. N84-32514
WILSON, C. J. N84-33300
WILSON, D. N84-33008
WINGERT, T. L. N84-32705
WINKELMAN, J. R. N84-32665
WINSOR, N. K. N84-33198
WINTER, J. R. N84-32873
WINTERS, M. N84-32901
WINTERSGILL, M. C. N84-32449
N84-32450
N84-32451
N84-32536
N84-33215
WINTHER, E. N84-33343
WOLFER, W. G. N84-32465
WOLFF, P. A. N84-33346
WOLFSON, O. N84-33262
WONG, S. N84-33346
WONG, V. N84-32700
WOOD, H. M. N84-33277
WOOD, J. R. N84-32357
WOOD, L. L. N84-32815
WOODARD, R. P. N84-33249
WOODWARD, P. R. N84-32768
WOOTEN, G. W. N84-32796
WORRALL, D. M. N84-33333
WRIGHT, I. G. N84-32518
WRIGHT, S. E. N84-32399
WRIGLEY, R. C. N84-32892
WU, A. Y. N84-33096
WYATT, J. L. N84-33361

X

XU, X. N84-33350
XUEYU, C. N84-33217

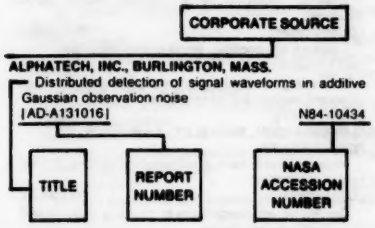
Y

YAGHJIAN, A. D. N84-32656
YAHYA, A. H. N84-33263
YAKHIMOVICH, S. I. N84-32480
YAMAMOTO, K. N84-33148
N84-33149
N84-33150
YAMAMOTO, Y. N84-33343
YANG, J. Y. N84-33106
YANG, T. C. N84-32995
YANIV, E. N84-33247
YAO, N. P. N84-32721
N84-32722
N84-32729
YARBROUGH, D. W. N84-32763
YATES, K. N84-32828
YEN, H. W. N84-33181
YOLDAS, B. E. N84-32814
YONEHARA, T. N84-33353
YONEZAWA, H. N84-32727
YONUSHONIS, T. M. N84-33309
YOON, Y. S. N84-32520
YOST, D. M. N84-32833
YOTHER, L. W. N84-33260
YOUNGALE, E. P. N84-33346
YOW, R. P. N84-33279
YUEN, C. W. N84-32964
YUEN, J. H. N84-32635
YUEN, Y. C. S. N84-33343
YUNG, C. S. N84-32629
YURA, J. A. N84-32887
N84-32888
YUZHAKOV, A. A. N84-32591

Z

ZAKRAJSEK, R. J. N84-32789
ZAMAN, A. N84-33139
N84-33139
ZANOTTI, C. N84-32554
ZARATE, D. A. N84-32543
ZAVESKY, R. J. N84-32425
ZELTSER, S. R. N84-33104
ZERR, B. A. N84-32819
ZESKIND, D. A. N84-33348
ZHANG, Q. F. N84-32390
ZIMM, C. B. N84-32515
ZINCHENKO, S. A. N84-32603
ZINEVICH, Y. P. N84-32582
ZINSMEISTER, M. N84-33040
ZOLLWEG, J. A. N84-32560
ZORASTER, S. N84-32900
ZUE, V. W. N84-33358
ZUIDEMA, H. N84-33012
ZUNIGA, M. A. N84-33350
ZUTAVERN, F. J. N84-32461

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ACUREX CORP., MOUNTAIN VIEW, CALIF.
Source-circuit design with multiple photovoltaic manufacturers N84-32685
Grounding and fault protection of the SMUD PVI array N84-32698
Interface standardization N84-32700

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Future requirements for airborne simulation [AGARD-AR-188] N84-32401
Occupational Medicine Relevant to Aviation Medicine [AGARD-CP-341] N84-33011

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
The need for biaxial fatigue testing at A.R.L. [AD-A143203] N84-32676
Array processor utilization in the computation of real-time images [ARL-SYS-TM-73] N84-33058
Flight systems raster graphics software reference manual [ARL-SYS-TM-72] N84-33072

AEROSPACE CORP., EL SEGUNDO, CALIF.
DC wiring system grounding and ground fault protection issues for central station photovoltaic power plants N84-32695
DC (Direct-Current) partial-discharge-environmental screening of space TWTs (Traveling Wave Tubes) [AD-A143290] N84-32710
A determination of the charge state of energetic magnetospheric ions by the observation of drift echoes [AD-A143181] N84-32954

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Hydrazine toxicology: Impact on safety and health in military aviation N84-33013

AEROSTRUCTURES, INC., ARLINGTON, VA.
Four new capabilities in NASTRAN for dynamic and aeroelastic analyses of rotating cyclic structures N84-32676

AEROTHERM ACUREX CORP., MOUNTAIN VIEW, CALIF.
Aerodynamic heating computations for projectiles. Volume 1: In-depth heat conduction modifications to the ABRES shape change code (BRLASCC) [AD-A143252] N84-32359
Aerodynamic heating computations for projectiles. Volume 2: Swept wing calculations using the planar version of the ABRES shape change code (PLNRASCC) [AD-A143253] N84-32360
Aerodynamic heating computations for projectiles. Volume 3: BRL interactive plotting program (BRLINPLOT) [AD-A143254] N84-32361

AIR COMMAND AND STAFF COLL., MAXWELL AFB, ALA.
IBM's token-ring LAN (Local-Area Network): A base-level communications solution [AD-A143446] N84-33063
Determination of factors affecting performance and productivity in an engineering/design environment [AD-A143315] N84-33252
Matrix management in DoD: An annotated bibliography [AD-A143316] N84-33253
Implementing automated information systems in the Air Force [AD-A143398] N84-33288

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
Shuttle detached spacecraft [AD-A143320] N84-32417
A probabilistic model for predicting the duration of levels of electromagnetic transmission in falling snow: Environmental research papers [AD-A143318] N84-32655
A Gerdien condenser system for measuring stratospheric charged particle densities [AD-A143317] N84-32958
Composition alteration of stratospheric air due to sampling through a flow tube: Environmental research papers [AD-A143319] N84-32959
Seismic hazard study for selected sites in New Mexico and Nevada [AD-A143392] N84-32960
Experiments in objective aviation weather forecasting using upper-level steering [AD-A143393] N84-32971

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
An evaluation of two reliability and maintainability information systems [AD-A143436] N84-33290

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Supersonic flows around a circular cone with or without blowing on the surface [AD-A143258] N84-32362
Dynamics of angular movements of a solid supporting a rotating rotor with consideration of energy dissipation [AD-A143349] N84-32881
Static methods in the design of nonlinear automatic control systems [AD-A143297] N84-33101
The proximity effects of superconducting multilayer film [AD-A143255] N84-33217

AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.
Effect of feed gas trace components on the SRC-1 hydrogen purification unit [DE84-012975] N84-32556

ALPHATECH, INC., BURLINGTON, MASS.
Sensor correlation and data fusion theory [AD-A143587] N84-33133

AMERICAN GAS ASSOCIATION LABS., CLEVELAND, OHIO.
Heat-of-mixing experiments for liquefied gases [PB84-215094] N84-32560
Advancement of developmental technology for pulse combustion applications [PB84-215268] N84-32576

AMES LAB., IOWA.
Application of elastic wave scattering theory to the detection and characterization of flaws in structural materials [DE84-013729] N84-32852
Relation of vertical intensity profiles for neutral atom lines to analyte atomization behavior in inductively coupled plasmas [DE84-014126] N84-33194
New materials from high temperature synthesis [DE84-014125] N84-33231

APPLIED MODELING, INC., WOODLAND HILLS, CALIF.
Design, test, and evaluation of an Air Force environmental model and data exchange [AD-A143226] N84-33060

ARCO SOLAR, INC., WOODLAND HILLS, CALIF.
Hot-spot investigations of utility scale panel configurations N84-32687
Evolution of integrated panel structural design and interfaces for PV power plants N84-32701
Qualification testing and electrical measurement experience: A manufacturer's view N84-32705

ARGONNE NATIONAL LAB., ILL.
Chemical stability of beta-aluminum [DE84-009835] N84-32545
Investigation of thermal stability of fluorinol-85 and 2-methylpyridine-water as Rankine cycle power system working fluids [DE84-006420] N84-32559
Modeling of concrete response at high temperature [DE84-009587] N84-32570
Lithium-alloy/metal sulfide battery research [DE84-013427] N84-32720
Effects of standtime on the available capacity of lead-acid and nickel/iron electric vehicle batteries [DE84-013452] N84-32721
Thermal management of a lithium/iron-sulfide battery [DE84-013438] N84-32722
Recent results from the National Battery Test Laboratory [DE84-012110] N84-32729
Characterization of voltage losses during high-intensity current pulses in reactive, porous electrodes of molten salt cells [DE84-012112] N84-32730
Electrochemical performance of porous nickel sulfide electrodes [DE84-009586] N84-32741
Sloshing response of a reactor tank with internals [DE84-009629] N84-32766
Heat transfer with phase change in plate-fin heat exchangers [DE84-006405] N84-32771
SEAMOPT: Sterling engine optimization code [DE84-012098] N84-32840
Uncertainty covariances in robotics applications [DE84-013417] N84-32843
Geology, hydrology, and mineral resources of crystalline rock areas of the northeastern United States [DE84-013672] N84-32901
Crystalline rocks of the Northeastern United States [DE84-013673] N84-32962
Coupling of Rayleigh-like waves with zero sound modes in normal He-3 [DE84-010519] N84-33153
Present status and probable future capabilities of heavy-ion linear accelerators [DE84-011741] N84-33158

ARIZONA UNIV., TUCSON.
Investigation of several aspects of LANDSAT 4/5 data quality [E84-10024] N84-32892
Solar variability observed through changes in solar figure and mean diameter [DE84-013914] N84-33328

ARMY RESEARCH AND TECHNOLOGY LABS., CLEVELAND, OHIO.
Investigation of the three-dimensional flow field within a transonic fan rotor: Experiment and analysis [NASA-TM-83739] N84-32357
Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine [NASA-TP-2309] N84-32388

ARMY RESEARCH INST. FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA.
Battery Computer System (BCS) human factors field evaluation [AD-A143425] N84-33062

ARMY RESEARCH INST. OF ENVIRONMENTAL MEDICINE, NATICK, MASS.
Correlation between plasma fibronectin level and mortality following experimental rats heat stress
[AD-A143383] N84-32691
AUBURN UNIV., ALA.
Theory of the electronic properties of mercury-cadmium-telluride alloys
[AD-A143426] N84-33221

B

BALL AEROSPACE SYSTEMS DIV., BOULDER, COLO.
Monolithic integrated antenna systems
[AD-A143184] N84-32708
BATTELLE COLUMBUS LABS., OHIO.
Source circuit design considerations N84-32690
Analysis of lead-acid battery deep-cycle accelerated testing data
[DE84-013192] N84-32736
BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Compendium of selected methods for sampling and analysis at geothermal facilities
[PB84-199926] N84-32579
BDM CORP., ALBUQUERQUE, N. MEX.
A review and summary of cell and module mismatch losses from theoretical and experimental studies N84-32689
Qualification testing for a central station N84-32706
BECHTEL CORP., SAN FRANCISCO, CALIF.
Photovoltaic system grounding and fault protection N84-32696
BENDIX FIELD ENGINEERING CORP., GRAND JUNCTION, COLO.
Calibration and performance of a high-resolution gamma-spectroscopy system
[DE84-012792] N84-32462
BJORKSTEN RESEARCH LABS., INC., MADISON, WIS.
Development of the sonic pump levitation
[NASA-CR-161963] N84-32749
BLACK AND VEATCH CONSULTING ENGINEERS, KANSAS CITY, MO.
Photovoltaic central station step and touch potential considerations in grounding system design N84-32699
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Loss factors measured in metal matrix composite materials
[AD-A143542] N84-32440
Application of stiffened cylinder analysis to ATP interior noise studies
[NASA-CR-172384] N84-33147
BOSTON UNIV., MASS.
An integral equation for the solution of nonlinear wave equations N84-32347
Infrared absorption spectrum of free carriers in polar semiconductors
[DE84-013276] N84-33248
BOWIE STATE COLL., MD.
Characterization of physiochemical properties of polymeric and electrochemical materials for aerospace flight
[NASA-CR-175258] N84-32534
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
A transportable satellite Earth station
[BBC-RD-1984/8] N84-32614
Video noise reduction
[BBC-RD-1984/7] N84-32615
BRITISH GAS CORP., LONDON (ENGLAND).
A study of Beta-hydroxyamines and Beta-hydroxysulphides as corrosion inhibitors for metals
[BLL-T6313/BG/WH773/84] N84-32467
On-site measurement of the speed of corrosion of a metal in water
[BLL-T6310/BG/WH770/84] N84-32468
BRITISH LIBRARY LENDING DIV., BOSTON SPA (ENGLAND).
The controlling reactions during interaction between silicon and carbon
[BLL-M-35673-(5828.4)] N84-32444
The importance of impact pressure in the development of the process of formation of bonds between metals in the solid phase
[BLL-M-35656-(5828.4)] N84-32473
Composition and structure of multicomponent vanadium- and niobium-base coatings
[BLL-M-35657-(5828.4)] N84-32474
Generalization of results of electro-simulation of temperature of the piece during centrifugal cladding
[BLL-M-35667-(5828.4)] N84-32479
Numerical calculations of the function of the static receptivity of electrons in metals
[BLL-M-35640-(5828.4)] N84-32480
Determination of thermodynamic characteristics of the barium dissolution process in liquid iron
[BLL-M-35634-(5828.4)] N84-32481
Solid-phase reaction of dispersed graphitized material with aluminium and nickel
[BLL-M-35633-(5828.4)] N84-32482
Influence of microalloying with titanium and boron on cold resistance of structural steel
[BLL-M-35698-(5828.4)] N84-32483
Investigation of the state of materials in plasma deposition of refractory coatings
[BLL-M-35686-(5828.4)] N84-32485
Cubic silicon nitride in iron-silicon steels
[BLL-M-35653-(5828.4)] N84-32486
Influence of direct current on temperature gradient in directionally solidifying ingot of alloy YuNDK35T5
[BLL-M-35684-(5828.4)] N84-32495
Features of behaviour of gas bubbles in molten oxide films during enamelling
[BLL-M-35672-(5828.4)] N84-32496
A procedure for determining the tempo at which alloys solidify
[BLL-M-35642-(5828.4)] N84-32497
Distribution of micro-heterogeneous deformation in O8Yu steel around inclusions during compression
[BLL-M-35641-(5828.4)] N84-32498
Influence of choice of pair-interaction potential on results of modelling an edge dislocation in Alpha-iron
[BLL-M-35682-(5828.4)] N84-32499
Producing thermomagnetic alloy by powder metallurgy
[BLL-M-35668-(5828.4)] N84-32500
Topochemical reactions and the Stefan problem
[BLL-M-35671-(5828.4)] N84-32501
Special features of the formation of a bed of polydispersed free-flowing materials
[BLL-M-35674-(5828.4)] N84-32747
Certain assumptions of theory of hydrodynamic lubrication during metal pressure working
[BLL-M-35681-(5828.4)] N84-32822
Calculation of thermal stress state for components of metallurgical equipment by electric simulation
[BLL-M-35690-(5828.4)] N84-32860
Free bulging of round diaphragm exposed to uniform pressure in state of creep
[BLL-M-35680-(5828.4)] N84-32861
Assessment of trends of input actions of inertial objects
[BLL-M-35689-(5828.4)] N84-33104
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Summary status of advanced water electrolysis and hydrogen storage/transport research and development
[DE84-012906] N84-32456
Recent developments in thermoluminescence kinetics
[DE84-013226] N84-32457
A two-fluid instability
[DE84-012899] N84-32764
The development of methods to predict both the dynamic and the pseudo-static response of secondary structures subjected to seismic excitations
[DE84-010284] N84-32884
Gamma-ray spectroscopy of hypernuclei
[DE84-013142] N84-33162
Mechanisms involved in the glow-discharge deposition of doped hydrogenated amorphous silicon
[DE84-013124] N84-33236
Nucleation and growth of N- and P-type microcrystals in low-temperature glow-discharge deposited silicon films
[DE84-013122] N84-33246
BROWN UNIV., PROVIDENCE, R. I.
Symbolic dynamics and nonlinear semiflows
[AD-A143467] N84-33117
BUNDESMINISTERIUM DER VERTEIDIGUNG, BONN (WEST GERMANY).
Evaluation and control of laser hazards N84-33018
BUREAU OF MINES, ALBANY, OREG.
Low-chromium heat-resisting ferritic alloys strengthened by the Chi Phase
[PB84-199041] N84-32524
BUTLER ANALYSES, TOWSON, MD.
Design spectrum analysis in NASTRAN N84-32870
Seismic analysis capability in NASTRAN N84-32871

C

CALIFORNIA INST. OF TECH., PASADENA.
Science support for the Earth radiation budget sensor on the Nimbus-7 spacecraft
[NASA-CR-175251] N84-32948
Ultraviolet response of film candidates for the solar optical telescope photometric filtergraph
[NASA-CR-175254] N84-33178
CALIFORNIA STATE POLYTECHNIC UNIV., POMONA.
Solar photochemical process engineering for production of fuels and chemicals
[NASA-CR-173910] N84-32917
CALIFORNIA UNIV., BERKELEY.
Comparison between two Lysholm engines
[DE84-013696] N84-32571
Altering the volumetric expansion ratio of a Lysholm helical screw expander
[DE84-013695] N84-32573
Empirical modeling of a Lysholm helical screw expander
[DE84-013694] N84-32574
Research in monolithic, signal-processing circuits
[AD-A143204] N84-32709
Developing turbulent flow in strongly curved passages of square and circular cross-section
[AD-A143279] N84-32755
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Molecular beam mass spectrometer sampling of flash ignited combustion
[DE84-006771] N84-32459
Conditional velocity statistics in premixed CH-4-air and C-2H-4-air turbulent flames
[DE84-012257] N84-32464
Microstructure, mechanical properties and two-body abrasive wear resistance of an Fe-3Cr-C based ultra-high strength steel
[DE84-014605] N84-32520
Effect of precipitated austenite on the fracture of a ferritic cryogenic steel
[DE84-014604] N84-32521
High-intensity discharge (HID) solid-state ballast program: Engineering development report, phase 2
[DE84-013882] N84-32726
General energy balance for battery systems
[DE84-013235] N84-32731
Developing turbulent flow in a 180(0) curved pipe and its downstream tangent
[DE84-013391] N84-32767
Technology Base Research Project for Electrochemical Energy Storage
[DE84-013877] N84-32930
Roles of ionizing radiation in cell transformation
[DE84-013397] N84-32995
Spot heating calculation for a heavy ion driven high temperature experiment
[DE84-013879] N84-33159
Negative ion formation due to hydrogen plasma surface interaction
[DE84-012259] N84-33192
Radial distribution function as an analysis technique
[DE84-013242] N84-33235
Effect of surface doping on the oxidation of chromia former alloys
[DE84-013390] N84-33247
The effect of dimensionality on solar spectrum curves
[DE84-014136] N84-33327
CALIFORNIA UNIV., DAVIS.
Mechanisms of thermoregulation of rats exposed to hypergravic fields N84-32989
CALIFORNIA UNIV., IRVINE.
Creep transitions in aluminum solid-solution alloys N84-32472
CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Influence of diluents and inhibitors on detonations
[DE84-006300] N84-32463
A comprehensive chemical kinetic reaction mechanism for the oxidation of n-butane
[DE84-005739] N84-32467
Cure reactions, network structure and mechanical response of diaminodiphenyl sulfone cured tetraglycidyl 4,4'diaminodiphenyl methane
[DE84-012607] N84-32548
Focusing twist reflector for electron-cyclotron resonance heating in the Tandem Mirror Experiment-upgrade
[DE84-012954] N84-32663
High-power RF compressor
[DE84-013118] N84-32664
Mechanisms of electrical conductivity in olivine
[DE83-017313] N84-32723
Large aperture electro-optical switch
[DE84-013089] N84-32728
Simulation of the Kelvin-Helmholtz instability of a supersonic slip surface with the Piecewise-Parabolic Method (PPM)
[DE84-013219] N84-32768
Strategies of design, development and activation of the Nova control system
[DE84-013075] N84-32801
Wafer-scale laser pantography. Part 6: Direct-write interconnection of VLSI gate arrays
[DE84-012676] N84-32815

Dynamic testing of NOVA laser structural systems. The north side of Spaceframe Tower
[DE84-014830] N84-32816
Experimental and modeling study of engine knock
[DE84-006134] N84-32844
Design of a high-performance slide and drive system for a small precision machining research lathe
[DE84-011059] N84-32845
Experimental and model transport and diffusion studies in complex terrain with emphasis on tracer studies
[DE84-013076] N84-32975
An online directory of databases for material properties
[DE84-013210] N84-33099
Physics issues in mirror and tandem mirror systems
[DE84-013837] N84-33201

CALIFORNIA UNIV., LOS ANGELES.
Programming productivity enhancement by the use of application generators
[AD-A143532] N84-33080
Observation of advanced particle removal rates in pump limiter simulation experiments
[DE84-014327] N84-33202
Electron localization and superconductivity of very thin epitaxially grown ag films on ge(001)
[AD-A143469] N84-33224
Updating replicated files in real time distributed processing systems N84-33264

CALIFORNIA UNIV., SAN DIEGO.
Studies of the microscale density fluctuations in the solar wind using interplanetary scintillations N84-33324

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
Trapped particle absorption by the Ring of Jupiter
[NASA-CR-173919] N84-33323

CALIFORNIA UNIV., SANTA BARBARA.
Stratigraphy and sedimentology of the upper Proterozoic Kingston Peak Formation, Panamint Range, eastern California N84-32939
Stability analysis of finite difference schemes for hyperbolic systems, and problems in applied and computational linear algebra
[AD-A143537] N84-33119

CAMBRIDGE UNIV. (ENGLAND).
Algorithmic integration of elementary transcendental functions on an algebraic curve N84-33052

CARBORUNDUM CO., NIAGARA FALLS, N. Y.
Ceramic component manufacturing technology development
[PB84-215276] N84-32550

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
On the finite element approximation of the stream function-vorticity equations
[AD-A143506] N84-32758

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
Particle environment
[NASA-CR-173888] N84-33210

CENTRE D'ETUDES ET DE RECHERCHES DE MEDECINE AEROSPATIALE, PARIS (FRANCE).
Visual perception in systems management in aeronautics N84-33017

CENTRE DE RECHERCHES DU SERVICE DE SANTE DES ARMEES, CLAMART (FRANCE).
Visual function and the definition of thresholds for exposure to laser radiation N84-33019

CHAM OF NORTH AMERICA, INC., HUNTSVILLE, ALA.
Rocket injector anomalies study. Volume 1: Description of the mathematical model and solution procedure
[NASA-CR-174702] N84-32428
Rocket injector anomalies study. Volume 2: Results of parametric studies
[NASA-CR-174703] N84-32429

CHEM TRONICS, INC., EL CAJON, CALIF.
Rigid closed-cell polyimide foams for aircraft applications and foam-in-place technology
[NASA-CR-171805] N84-32535

CHICAGO UNIV., ILL.
Optimal measurement of ice-sheet deformation from surface-marker arrays
[NASA-CR-173877] N84-32950

CHRYSLER CORP., NEW ORLEANS, LA.
Aerothermodynamic data base
[NASA-CR-171807] N84-32415

CINCINNATI UNIV., OHIO.
Inelastic strong interactions at high energies
[DE84-013647] N84-33170

CIVIL AERONAUTICS BOARD, WASHINGTON, D.C.
Voluntary accounting systems for a small air carrier: Revenues, financial and traffic statistics
[PB84-210096] N84-32369
Economic cases of the Civil Aeronautics Board, volume 104, October - November 1983
[PB84-209287] N84-32370

COLORADO SCHOOL OF MINES, GOLDEN.
Ferrous alloy metallurgy, liquid lithium corrosion and welding
[DE84-014656] N84-32517

COLORADO STATE UNIV., FORT COLLINS.
Geology and origin of the Aquila iron deposit in southwestern Michoacan, Mexico N84-32690

COLORADO UNIV., BOULDER.
Pilot study and evaluation of a SMMR-derived sea ice data base
[NASA-CR-175255] N84-32696

COMMITTEE ON SCIENCE AND TECHNOLOGY (U. S. HOUSE).
Agriculture and water use: Present and future issues
[GPO-30-599] N84-32897
National environmental monitoring
[GPO-26-166] N84-32933
Agriculture weather services
[GPO-27-913] N84-32966
Hurricane Alicia: Prediction, damage and recovery efforts
[GPO-33-446] N84-32968
The 1985 NASA authorization, volume 2
[GPO-34-202] N84-33301
Oversight on the Federal Aviation Administration fiscal year 1985 research, engineering and development budget request
[GPO-34-924] N84-33302
National Aeronautics and Space Administration Authorization Act, 1985
[PUB-LAW-98-361] N84-33303

COMMITTEE ON SMALL BUSINESS (U. S. HOUSE).
Impact of robots and computers on the work force of the 1980's
[GPO-31-912] N84-32826

COMPUTER HORIZONS, INC., CHERRY HILL, N. J.
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents. Appendix
[PB84-196997] N84-33255
Ten year trends in US technological dependence on foreign technology as indicated by referencing from US patents
[PB84-197003] N84-33256

COMPUTER SCIENCES CORP., SILVER SPRING, MD.
Software conversion history of the Flight Dynamics System (FDS)
[NASA-CR-175257] N84-32404
Flight Experiment Demonstration System (FEDS): Mathematical specification
[NASA-CR-175252] N84-32405

COMPUTER SOFTWARE MANAGEMENT AND INFORMATION CENTER, ATHENS, GA.
Twelfth NASTRAN Users' Colloquium
[NASA-CP-2326] N84-32864

CONNECTICUT UNIV., STORRS.
A study of the extent of automation in small college libraries and relationships of attitudes of library directors toward it N84-33260

CORNELL UNIV., ITHACA, N.Y.
Probabilistic models of the stress-rupture of composite materials: Summary
[DE84-013477] N84-32441

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA).
Metal coating of diamond abrasives (review of foreign patents)
[CSIR-TRANS-1740] N84-32489
Slavutich high-cobalt WC-Co-matrix alloy
[CSIR-TRANS-1739] N84-32490
Pastes of superhard materials (review of inventions)
[CSIR-TRANS-1741] N84-32491
Effect of formation conditions and contact zone structure on adhesion strength of carbide forming metal coatings on diamond
[CSIR-TRANS-1735] N84-32492
Sintered hard metal alloys and process for their manufacture
[CSIR-TRANS-1748] N84-32493
Obtaining iron-55 with high radiochemical purity
[CSIR-TRANS-1751] N84-32494
Coatings on diamond and CBN abrasives (review of inventions)
[CSIR-TRANS-1742] N84-32525
A diffusion mechanism in the catalytic conversion of carbonaceous materials into diamonds at high pressures
[CSIR-TRANS-1743] N84-32526
Development and testing of glass coatings for Hexanite-A powders
[CSIR-TRANS-1747] N84-32527
Diamond syntheses from various graphites
[CSIR-TRANS-1749] N84-32528
Structure of polycrystalline boron nitride as determined by electron microscopic thin sections
[CSIR-TRANS-1738] N84-32533
Economic use of CBN grinding tools in the production of jet turbine components
[CSIR-TRANS-1736] N84-32561
Economical grinding of steel and sintered carbides using superhard abrasives and high temperature-resistant bonds
[CSIR-TRANS-1744] N84-32562
Forty years of development in diamond tools
[CSIR-TRANS-1730] N84-32564
New machines for grinding, facetting and profiling hard materials
[CSIR-TRANS-1750] N84-32821
The octahedron-rhombododecahedron morphological series of synthetic diamond crystals
[CSIR-TRANS-1746] N84-33205
Epitaxial crystallization in the Te-HgTe-CdTe system
[CSIR-TRANS-1745] N84-33206
EPR investigation of inclusions in cubic boron nitride crystals
[CSIR-TRANS-1752] N84-33207

D

DANISH DEFENCE COMMAND, COPENHAGEN.
Handling of hydrazine in the Royal Danish Air Force N84-33014

DARTMOUTH COLL., HANOVER, N.H.
Role of grain size on the brittle to ductile transition of the strongly ordered alloy Ni3Al
[DE84-014904] N84-32519
Observations of the ultraviolet spectra of helium (DB) white dwarfs and a study of the ultraviolet spectra of white dwarfs containing carbon
[NASA-CR-173889] N84-33310

DAYTON UNIV., OHIO.
Mechanical property data 15-5PH (H1025) stainless steel alloy: Hot-rolled plate
[AD-A143327] N84-32510
Mechanical property data 7175-t736 aluminum alloy: Hand forging
[AD-A143328] N84-32511

DEACON RESEARCH, PALO ALTO, CALIF.
Measurement of the transverse mode excitation in the stimulated emission of the ACO free electron laser
[AD-A143449] N84-32608

DEFENCE AND CIVIL INST. OF ENVIRONMENTAL MEDICINE, DOWNSVIEW (ONTARIO).
An unusual toxicological property of alcohol: The density effect on the organ of balance N84-33016

DEFENSE TECHNICAL INFORMATION CENTER, ALEXANDRIA, VA.
Source hierarchy list. Volume 1: A through H
[AD-A143500] N84-33291
Source hierarchy list. Volume 2: I through Z
[AD-A143501] N84-33292

DELAWARE UNIV., NEWARK.
Statistics of fracture of composite materials under multiaxial loading N84-32433
Numerical techniques for the prediction of flow induced orientation N84-32743
Natural convection in porous media: An experimental and numerical study for vertical annular and rectangular enclosures N84-32744

DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Method for forming fibrous silicon carbide insulating material
[DE84-014658] N84-32442
Electronically conductive ceramics for high temperature oxidizing environments
[DE84-014506] N84-32549
Method and apparatus for making superconductive magnet coils
[DE84-014510] N84-32737
High power microwave generator
[DE84-014230] N84-32738
Electrode-active material for electrochemical batteries and method of preparation
[DE84-014508] N84-32739
Magnetic fluorescent lamp
[DE84-014231] N84-32740
Laser utilizing a gaseous lasing medium and method for operating the same
[DE84-014500] N84-32819
Fuel injection device and method
[DE84-014320] N84-32846
Autogenerator of beams of charged particles
[DE84-014242] N84-33163

DEPARTMENT OF THE AIR FORCE, WASHINGTON, D.C.
Method of making compartmented, filament wound, one-piece aircraft fuel tanks
[AD-D011144] N84-32376
Axisymmetric thrust augmenting ejector with discrete primary air slot nozzles
[AD-D011129] N84-32386
Thrust Reverser/Exhaust nozzle assembly for a gas turbine engine
[AD-D011101] N84-32392

Flexible, resilient anti-contamination baffle
[AD-D011111] N84-32421
Low cost thermal protection system processing
[AD-D011142] N84-32434
Method for the particle size independent spectrometric determination of metal particles in lubricating oils and hydraulic fluids
[AD-D011121] N84-32445
Method to reveal microstructures in single phase alloys
[AD-D011094] N84-32512
Perfluoroalkylether substituted phenyl phosphines
[AD-D011122] N84-32529
Protected ethynylated phenols
[AD-D011096] N84-32544
Simulation of an electronic countermeasure technique
[AD-D011143] N84-32619
Simultaneous detection of time coincident signals in an adaptive Doppler tracker
[AD-D011092] N84-32659
Phase shift keying apparatus
[AD-D011119] N84-32660
Universal control grid modulator
[AD-D011108] N84-32672
Programmable signal processing device
[AD-D011109] N84-32673
Machined two-piece microwave waveguide
[AD-D011088] N84-32715
Compact broadband rectangular to coaxial waveguide junction
[AD-D011091] N84-32716
Soldering method for cable connectors
[AD-D011103] N84-32718
Backfire bifilar helix antenna
[AD-D011118] N84-32719
Three-wire static strain gage apparatus
[AD-D011130] N84-32776
Temperature controlled gyro
[AD-D011138] N84-32777
Variable gain oven temperature control circuit
[AD-D011141] N84-32778
Eye safe laser transmitter
[AD-D011145] N84-32779
Portable visual function tester
[AD-D011105] N84-32795
Low heat loss laser combustion chamber
[AD-D011107] N84-32799
Transverse flow CW atomic iodine laser system
[AD-D011098] N84-32810
Laser beam duct pressure controller system
[AD-D011102] N84-32811
Beam recombination via cylindrical mirror
[AD-D011104] N84-32812
CW HF R-branch laser
[AD-D011120] N84-32813
Shaft positioning device
[AD-D011087] N84-32836
Deactivation of thionyl chloride cells
[AD-D011113] N84-32908
Solid state tetrachloroaluminate storage battery having a transition metal chloride cathode
[AD-D011133] N84-32924
Programmable arithmetic logic unit
[AD-D011128] N84-33055
Real-time optical filtering system with spatial and temporal enhancement of visual information
[AD-D011106] N84-33172
Varying bandpass of optical spatial filter by rotating mirrors having changing reflectivity
[AD-D011114] N84-33173
Optical power source control system
[AD-D011124] N84-33175
Optical distortion analyzer system
[AD-D011127] N84-33176
Replication of high power laser mirrors
[AD-D011140] N84-33177
Phase-only optical filter for use in an optical correlation system
[AD-D011093] N84-33187
Method of measuring optical properties of a transparency
[AD-D011117] N84-33188
Electroding of multi-layered epitaxial structures
[AD-D011137] N84-33209
Process for the epitaxial deposition of III-V compounds utilizing a binary alloy as the metallic source
[AD-D011097] N84-33229

DEPARTMENT OF THE ARMY, WASHINGTON, D. C.
Tactical high frequency array antennas
[AD-D011095] N84-32717

DEPARTMENT OF THE NAVY, WASHINGTON, D. C.
Position and restraint system for aircrewman
[AD-D011058] N84-32364
Direct measurement of Earth's vertical deflection using global positioning system
[AD-D011099] N84-32373
Pin rooted blade biaxial air seal
[AD-D011086] N84-32391
Underwater depth telemetry
[AD-D011054] N84-32418
Expendable infrared source and method therefor
[AD-D011112] N84-32551
3,5,5-trinitro-3-azaheptane-1,7-diol and a method of synthesis
[AD-D011132] N84-32555
Quick Deployment Vehicle (QDV)
[AD-D011060] N84-32563
Around-a-mast quadrifilar microstrip antenna
[AD-D011051] N84-32617
Signal waveform detector using synthetic FM demodulation
[AD-D011055] N84-32618
Method for making Josephson junctions with contamination-free interfaces utilizing a ZNO contact insulator
[AD-D011057] N84-32671
Cascaded adaptive loops
[AD-D011116] N84-32674
Grounding ring for shielded cable
[AD-D011135] N84-32675
Digital multi-tapped delay line with automatic time-domain programming
[AD-D011136] N84-32676
Pulse driver for flux gate magnetometer
[AD-D011053] N84-32774
Visual field perimeter and psychomotor tracking performance measuring apparatus
[AD-D011056] N84-32775
Fiber optic magnetometer for the detection of dc magnetic fields without hysteretic ambiguity
[AD-D011065] N84-32794
Interferometrically tuned laser resonator
[AD-D011125] N84-32800
Adjustable self-releasing hook
[AD-D011082] N84-32834
Hybrid seal
[AD-D011083] N84-32835
Target for optically activated seekers and trackers
[AD-D011059] N84-33171
Fiber optic sensor with enhanced immunity to random environmental perturbations
[AD-D011115] N84-33174
Polynominal grating
[AD-D011090] N84-33186
Method for fabricating MNOS structures utilizing hydrogen ion implantation
[AD-D011123] N84-33208

DREXEL UNIV., PHILADELPHIA, PA.
Research on output feedback control of systems with ill-conditioned dynamics
[NASA-CR-173921] N84-33071

DU PONT DE NEMOURS (E. I.) AND CO., AIKEN, S.C.
Mechanical seal program
[DE84-012421] N84-32838

E

ECOLE POLYTECHNIQUE, PALAISEAU (FRANCE).
Numerical diffraction by a uniform grid
[DE84-012661] N84-33121

ECONOMIC RESEARCH SERVICE, WASHINGTON, D. C.
Search command for character strings and words in computer files on CMS (Conversational Monitor System)
[PB84-201243] N84-33068

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
Processing and consolidation of rapidly solidified alloys: A technology assessment
[DE84-014673] N84-32523
New techniques for adjusting reference factors
[DE84-012649] N84-33300

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND).
Analysis of parametrically excited large vibration systems
[AD-A143283] N84-32879

ENTROPY LTD., LINCOLN, MASS.
Seasonal precipitation forecasting with a 6 to 7 month lead time in the Pacific Northwest using an information theoretic model
[PB84-207018] N84-32979

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO.
Construction and evaluation of a flow test stand
[PB84-201581] N84-32906

ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
Urban scale variations of turbulence parameters and fluxes
[PB84-209113] N84-32980
Diffusion modeling with convective scaling and effects of surface inhomogeneities
[PB84-210053] N84-32981

F

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D.C.
Noise measurement flight test: Data-analyses Aerospatiale SA-365N Dauphin 2 helicopter
[AD-A143229] N84-33151

FEDERAL AVIATION AGENCY, ATLANTIC CITY, N.J.
Modified reflex-percussive grooves for runways
[AD-A143569] N84-32400

FEDERAL COMPILER TESTING CENTER, FALLS CHURCH, VA.
Programmer productivity aid catalog
[PB84-212166] N84-33095

FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, D.C.
Time-to-corrosion of reinforcing steel in concrete slabs. Volume 5: Calcium nitrite admixture or epoxy-coated reinforcing bars as corrosion protection systems
[PB84-195239] N84-32578
Microcomputers in transportation: Software and source book
[PB84-195155] N84-33067

FEDERATION NATIONALE RESEARCHE SCIENTIFIQUE, LIEGE (BELGIUM).
Wave fronts to infinity of real analytic functions
N84-33031

FERMI NATIONAL ACCELERATOR LAB., BATAVIA, ILL.
Beam cavity coupling impedance
[DE84-014064] N84-32662
Possible cosmological origin of the ultra high energy cosmic rays
[DE84-013083] N84-33334

FLORIDA INST. OF TECH., MELBOURNE.
Space reactors: What is a kilogram?
[DE84-012656] N84-33169

FLORIDA STATE UNIV., TALLAHASSEE.
Two-dimensional finite amplitude mountain waves in the presence of moisture N84-32947
TP2 orderings
[AD-A143434] N84-33132
Kolmogorov's and Mourier's strong laws for arrays with independent and identically distributed columns
[AD-A143222] N84-33139
The role of the state library agency in the future: A Delphi study N84-33258

FOSTER-MILLER ASSOCIATES, INC., WALTHAM, MASS.
Steam bottoming cycle for an adiabatic diesel engine
[NASA-CR-168255] N84-33304

G

GA TECHNOLOGIES, INC., SAN DIEGO, CALIF.
An improved method for the prediction of centrifugal compressor rotational-tone noise
[DE84-013345] N84-32842
Behavior of orbits of two coupled oscillators
[DE84-013379] N84-33197

GATES LEARJET CORP., WICHITA, KANS.
Computer aided modeling and post processing with NASTRAN analysis N84-32869

GCA CORP., BEDFORD, MASS.
Locating and estimating air emissions from sources of chloroform
[PB84-200617] N84-32935
Locating and estimating air emissions from sources of carbon tetrachloride
[PB84-200625] N84-32936

GENERAL ACCOUNTING OFFICE, WASHINGTON, D. C.
Legislation needed to clarify future of consumer protection and federal preemption after the Civil Aeronautics Board sunsets
[PB84-210103] N84-32371
Analysis of benefits realized from multiyear contracting for the Black Hawk helicopter
[AD-A143485] N84-33254
Alaska Land Conveyance Program: A slow, complex and costly process
[PB84-207265] N84-33294

GENERAL ELECTRIC CO., CINCINNATI, OHIO.
JT15D simulated flight data evaluation
[NASA-CR-172322] N84-32387
High temperature electronics technology
[AD-A143571] N84-32714
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 1: Test nozzles and acoustic data
[NASA-CR-168234-VOL-1] N84-33148

Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 2: Laser velocimeter data
[NASA-CR-168234-VOL-2] N84-33149
Experimental investigation of shock-cell noise reduction for single-stream nozzles in simulated flight, comprehensive data report. Volume 3: Shadowgraph photos and facility description
[NASA-CR-168234-VOL-3] N84-33150

GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Design and selection of bypass diodes N84-32688

GENEVA UNIV. (SWITZERLAND).
Determinants connected with a trace on a Banach algebra N84-33036

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
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[DE84-007193] N84-32902

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[NASA-TM-86857] N84-32090

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Nonlinear elastic stability analysis of plane frames N84-32853
Random vibrations of multicomponent structures N84-32854
The design and performance of a parallel computer architecture for simulation N84-33054

GEORGIA STATE UNIV., ATLANTA.
A study of heat release rate distribution in a gas turbine combustor by acoustic measurements N84-32385

GEORGIA UNIV., ATHENS.
Twelfth NASTRAN Users' Colloquium
[NASA-CP-2328] N84-32664

GHENT UNIV. (BELGIUM).
Completely continuous multipliers from L sub 1 (G) into L sub infinity (G) N84-33047

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[ISSN-0373-0956] N84-33025
Singularities connected with a trace on a Banach algebra N84-33034
Annals of the Fourier Institute, volume 34, no. 2
[ISSN-0373-0956] N84-33038
Infinitesmal deformation of locally symmetrical Riemann spaces. 2: Blaschke's infinitesimal conjecture for complex projective space N84-33049

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Multi-leg heat pipe evaporator
[NASA-CASE-MSC-20812-1] N84-32748

GT-DEVICES, ALEXANDRIA, VA.
Research and development of a plasma jet mass accelerator as a driver for impact fusion
[DE84-012940] N84-33198

H

HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
Effective thermophysical and elastic properties of materials with voids
[DE84-013942] N84-32465
Fundamental alloy studies
[DE84-013941] N84-32513

HARVARD UNIV., CAMBRIDGE, MASS.
Unraveling photosystems
[DE84-013812] N84-32994
Theoretical issues in the design and verification of distributed systems N84-33096
Drift mobilities by time-of-flight methods and time-dependent photoransport in the nanosecond regime in amorphous semiconductors
[DE84-014906] N84-33241
Invariant formulation of and radiative corrections in quantum gravity N84-33249
The nature and origin of refractory inclusions in the Allende meteorite N84-33318

HAWAII UNIV., MANOA.
Field surveys of carbon monoxide in commercial settings using personal exposure monitors
[PB84-211291] N84-32797

HEALTH EFFECTS RESEARCH LAB., RESEARCH TRIANGLE PARK, N. C.
Immunologic effects of electromagnetic fields (1981 - 1983)
[PB84-190602] N84-33008
Integration of species sensitivity and dosimetry data in the extrapolation of ozone and nitrogen dioxide health data from animals to man
[PB84-195312] N84-33010

HIROSHIMA UNIV. (JAPAN).
On the boundary limits of harmonic functions with gradient in L sup p N84-33030

HONEYWELL, INC., MINNEAPOLIS, MINN.
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 6
[NASA-CR-171126] N84-32780
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171125] N84-32781
Research pressure instrumentation for NASA Space Shuttle main engine, modification no. 5
[NASA-CR-171128] N84-32949

HUGHES AIRCRAFT CO., EL SEGUNDO, CALIF.
Ku-Band rendezvous radar performance computer simulation model
[NASA-CR-171804] N84-32650

HUGHES AIRCRAFT CO., LONG BEACH, CALIF.
Qualification and testing of modules N84-32704

HUGHES AIRCRAFT CO., LOS ANGELES, CALIF.
Electrical safety for high voltage arrays N84-32697

HUGHES RESEARCH LABS., MALIBU, CALIF.
Definition, analysis and development of an optical data distribution network for integrated avionics and control systems. Part 2: Component development and system integration
[NASA-CR-172429] N84-33181
Investigation of optical fibers for nonlinear optics
[AD-A143565] N84-33185
Basic problems in InP technology
[AD-A143456] N84-33222

HUGHES TOOL CO., CULVER CITY, CALIF.
Nonlinear analysis of a bolted marine riser connector using NASTRAN substructuring N84-32675

I

IBM RESEARCH LAB., SAN JOSE, CALIF.
Raman and infrared spectroscopy of molecules adsorbed on metal electrodes
[AD-A143466] N84-32454
The interpretation of very low frequency Raman scattering from roughened silver electrodes: Clusters, cavities or complexes?
[AD-A143471] N84-33184

IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
High-efficiency multi-colored photovoltaic cells
[PB84-200575] N84-32932

ILLINOIS UNIV., CHICAGO.
Hybrid stress reduced-Mindlin elements for thin multilayer plates with application to edge contact problems N84-32857

ILLINOIS UNIV., URBANA.
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-173916] N84-32645
Visible and near-infrared dissociation lasers
[AD-A143295] N84-32807
Higher layer protocols for a workstation architecture
[DE84-013649] N84-33087
Distributions of central quadratic forms in normal variables: A comparison of algorithms
[AD-A143466] N84-33116

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND).
An application of fine potential theory to prove a Phragmen Lindelof theorem N84-33043

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On the A-integrability of singular integral transforms N84-33042

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A simulation of remote sensor systems and data processing algorithms for spectral feature classification
[NASA-CR-172393] N84-32784

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Microwave terrestrial link rain attenuation prediction parameter analysis
[PB84-207964] N84-32666
Computer-based transmission monitor and control system
[PB84-202068] N84-33069

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Effects of system and geometrical parameters on the flow of Class-B solids in overflow standpipes
[DE84-013946] N84-32762

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A description of the ground segment of CNES, ESA, and TELESAT
[INPE-2984-NTE/211] N84-32407
Comparison of analytical theories for studying the contraction of artificial satellite orbits
[INPE-2746-PRE/322] N84-32409
Quantitative interpretation of aeromagnetic anomalies in the Sinclinal Gandarela
[INPE-3070-PRE/487] N84-32668
DCP systems and characteristics
[INPE-2948-PRE/431] N84-32899
Solar tides in the mesospheric sodium layer
[INPE-2942-TDL/151] N84-32953
The severity of the Brazilian freeze of 1981 as monitored in real time by satellite
[INPE-2586-PRE/234] N84-32967
Aspects of the Brazil current system according to SMS-2, NOAA-6, and Tiros-N satellites for 1979 to 1980
[INPE-2975-RPE/450] N84-32982
Southern oscillation-El Nino events: Characteristics, evolution, and precipitation anomalies
[INPE-2976-PRE/438] N84-32983
The compression of digital imagery by transformation
[INPE-2893-PRE/412] N84-33073
Quantitative analysis of satellite infrared imagery using digital storage equipment
[INPE-2978-PRE/440] N84-33074
The use of pipeline techniques in the architecture of digital processors employed in real time applications
[INPE-2992-TDL/153] N84-33075
Controller technique of compensation figured in an active control scheme on the accumulated effects of deviation in the modeling
[INPE-2987-TDL/152] N84-33100
Analytical solution for computing first and second order ordinary differential equations using a method of series development
[INPE-2980-PRE/442] N84-33110
Development of a spectroradiometer with a linear network of detectors from standard CCD
[INPE-3095-TDL/165] N84-33180
Manufacture and characterization of Pb(1-x)Sn(x)Te photoconductors
[INPE-3045-TDL/157] N84-33212
Quantitative treatment of fuzzy relations in the process of allocating resources to R and D projects
[INPE-2761-PRE/336] N84-33251

INTERNATIONAL COAL REFINING CO., ALLENTOWN, PA.
Effect of feed gas trace components on the SRC-1 hydrogen purification unit
[DE84-012975] N84-32556

IONICS, INC., WATERTOWN, MASS.
Reference plant for high temperature electrodialysis desalting of seawater
[PB84-195841] N84-32471

IOWA UNIV., IOWA CITY.
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[NASA-CR-173675] N84-32406
Measurement of skin friction in unsteady boundary layers using a flush-mounted hot-film gage
[PB84-197995] N84-32773
Aggradation and degradation at alluvial-channel beds
[PB84-201557] N84-32905
Test procedures and design methods for reliable large scale integrated circuits and systems
[AD-A143324] N84-33061

ITEK CORP., LEXINGTON, MASS.
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[NASA-CR-173686] N84-33319

J

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Plasma switch development
[AD-A143233] N84-32711

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[NASA-CR-173693] N84-32403
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[NASA-CR-173690] N84-32448
Stabilized unsaturated polyesters
[NASA-CASE-NPO-16103-1] N84-32530
Synchronization tracking in pulse position modulation receiver
[NASA-CASE-NPO-16256-1] N84-32620
The Telecommunications and Data Acquisition Report
[NASA-CR-173685] N84-32622
A high-performance hybrid RF isolation amplifier N84-32623
Optimization of antenna structure design N84-32624
High power K sub a -band transmitter for planetary radar and spacecraft uplink N84-32625
Magnetic refrigeration development N84-32626
Potential surface improvements by bump removal for 64-m antenna N84-32627

The 64-m antenna automatic subreflector focusing controller N84-32628
Intermodulation product levels in flame-sprayed materials N84-32629
Performance simulation for unit-memory convolutional codes with byte-oriented Viterbi decoding algorithm N84-32630
A simple algorithm for the metric traveling salesman problem N84-32631
Symbol-stream combiner: Description and demonstration plans N84-32632
Error-trellis syndrome decoding techniques for convolutional codes N84-32633
Coherent digital demodulation of a residual carrier signal using IF sampling N84-32634
A strategy for successful deep space information transmission in bad weather N84-32635
Tropospheric delay effects in radio interferometry N84-32636
Investigation and rehabilitation to extend service life of DSS-13 antenna concrete foundation N84-32637
NASTRAN structural model for the large 64-meter antenna pedestal. Part 3: Applications to hydrostatic bearing oil film N84-32638
Availability of the DSN telemetry data system and its major elements, including the TWM assemblies N84-32639
A study of DSN traveling wave maser system reliability N84-32640
GCF compatibility with packets and data compression N84-32641
Earth orientation effects on mobile VLBI baselines N84-32642
Mojave base station implementation N84-32643
Proceedings of the Flat-Plate Solar Array Project Research Forum on the Design of Flat-Plate Photovoltaic Arrays for Central Stations
[NASA-CR-173918] N84-32683
Source-circuit design overview N84-32684
Hot-spot heating in central-station arrays N84-32686
Electrical insulation design requirements and reliability goals N84-32691
Hipot and continuity qualification est experience N84-32692
Laboratory experience with voltage breakdown N84-32693
Breakdown of organic insulators N84-32694
Qualification tests and electrical measurements: Practice and problems N84-32703
Stable density stratification solar pond
[NASA-CASE-NPO-15419-2] N84-32910
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
Wind loading on solar concentrators: Some general considerations
[NASA-CR-173896] N84-32915
Review of solar fuel-producing quantum conversion processes
[NASA-CR-173904] N84-32916
Solar photochemical process engineering for production of fuels and chemicals
[NASA-CR-173910] N84-32917
A nomographic methodology for use in performance trade-off studies of parabolic dish solar power modules
[NASA-CR-173908] N84-32918
Survey of manufacturers of high-performance heat engines adaptable to solar applications
[NASA-CR-173911] N84-32919
Module utilization committee
[NASA-CR-173898] N84-32920
Flate-plate photovoltaic power systems handbook for Federal agencies
[NASA-CR-173901] N84-32921
Stand-alone flat-plate photovoltaic power systems: System sizing and life-cycle costing methodology for Federal agencies
[NASA-CR-173903] N84-32922
Low loss splicing method for single-mode optical fiber
[NASA-CASE-NPO-16294-1] N84-33179
FET charge sensor and voltage probe
[NASA-CASE-NPO-16045-1] N84-33211
Polycrystalline silicon study: Low-cost silicon refining technology prospects and semiconductor-grade polycrystalline silicon availability through 1988
[NASA-CR-173897] N84-33213
Data communication between data terminal equipment and the JPL administrative data base management system N84-33278
Conceptual design of a monitoring system for the Charters of Freedom
[NASA-CR-173909] N84-33285
Effects of expiration of the Federal energy tax credit on the National Photovoltaics Program
[NASA-CR-173900] N84-33299

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[JPRS-UEE-84-006] N84-32580
Synthesis of antennas with weak superdirectivity N84-32581
Angle resolution of wideband signals received by two slightly diverse linear antenna arrays N84-32582
Thermoscopic study of diffraction current distribution N84-32583
Concerning power recovered by receiving antenna from incident field N84-32584
Intensity of radiowave scattering on anisotropic irregularities with various positions of scattering volume about caustic zone N84-32585
Reflection of electromagnetic waves from inhomogeneous media N84-32586
Optimum synthesis of stepped second class phase-shifters N84-32587
Relations between algorithms of adaptive optimization of antenna arrays and algorithms of optimum detection of multidimensional stochastic signal N84-32588
Autocorrelation receiver for Doppler short-range radar systems N84-32589
Threshold signals for detector having stabilization of false alarm probability N84-32590
Adaptive analog-to-digital converter N84-32591
Light-emitting diode matrix flat screen N84-32592
Estimation of senativity threshold in integrating analog-to-digital converters with averaging of readings N84-32593
Inductive transducer for displacement-to-frequency conversion N84-32594
Simulator-probe for diagnostic testing of short-wave radio channels N84-32595
Peculiarities in construction of optical receivers for digital fiber-optic communication lines N84-32596
Random signal recognition based on spectral moments N84-32597
Interrelation between parameters of M-type traveling wave tube N84-32598
Frequency conversion in photomultiplier during interaction of photoelectron beam and electric field in heterodyne N84-32599
High-speed thyristors on weakly doped GaAs N84-32600
Image identification by method of integral fluctuations N84-32601
Josephson point contacts noise properties at microwave N84-32602
Utilization of nonlinear properties of IMPATT-diodes in microwave devices (survey) N84-32603
Superconductive films in microwave microelectronics (survey) N84-32604
Intermodulation distortions in semiconductor microwave receivers and transmitters (survey) N84-32605
Approximation models for electrodynamic systems in solid state millimetric wave devices N84-32606
Millimetric wave frequency converter using Gunn-effect diode N84-32607
Design of locked microwave oscillators on basis of scattering parameters of transistors operating in large signal mode N84-32608
Correlational estimation of parameters of solid state microwave devices N84-32609
Modulation of microwave power with electron transfer diodes N84-32610
Stable asynchronous two-frequency oscillations in Gunn-effect diode with open resonator structure N84-32611
Intermodulation in protective semiconductor microwave devices N84-32612
Evaluation of the limiting accuracy in determining the coordinates of a point light source by a television tracking system using an image disector with the presence of a nonstationary current component N84-32613
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-84-018] N84-32996
Pilot jet lag experiments described N84-32997
Effect of cyclic changes in cultivation conditions of growth kinetics and physiological properties of yeasts N84-32998
Microbiology and food program N84-32999
Modeling of lethal electric shock N84-33000
Resistance of microorganisms from mesosphere to periodic freezing-thawing N84-33001
Effects of insulin and hydrocortisone on energy metabolism in rats irradiated with fast, 60 MeV neutrons N84-33002
West Europe report: Science and technology
[JPRS-WST-84-030] N84-33141
Swedish research in high-temperature ceramics, superalloys N84-33142
French firm uses unique flexible workshop with laser cutter N84-33143
Sweden: Optical fiber carries laser power for welding N84-33144

K

KANSAS STATE UNIV., MANHATTAN.
Chemistry of energetic fragments: Hypovalent radicals
[AD-A143269] N84-32453

L

LABORATOIRE CENTRAL DE BIOLOGIE AEROSPATIALE, PARIS (FRANCE).
A comparative study in the animal of the toxicity of the combustion products of diverse materials N84-33015
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[DE84-012866] N84-33154
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[NASA-CR-175253] N84-32802
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[AD-A143525] N84-32455
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[NASA-CR-173892] N84-32863
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[NASA-CR-175261] N84-32646
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Autonomous Integrated Receive System (AIRS) requirements definition. Volume 3: Performance and simulation
[NASA-CR-175263] N84-32648
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[NASA-CR-175264] N84-32649
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[NASA-CR-175260] N84-32750
LOCKHEED-CALIFORNIA CO., BURBANK.
Development and flight evaluation of an augmented stability active controls concept with a small tail
[NASA-CR-173880] N84-32395
LOCKHEED ENGINEERING AND MANAGEMENT SERVICES CO., INC., HOUSTON, TEX.
Columbia: The first five flights. Entry heating data series. Volume 6: The upper leeside surface centerline
[NASA-CR-171795] N84-32414
Columbia: The first 5 flights entry heating data series. Volume 5: The side fuselage and payload bay door
[NASA-CR-171732] N84-32416
LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Pressure-dependent resistive behavior of YbBe13
[DE84-010068] N84-32514
Thermomagnetic properties of GdPd
[DE84-009991] N84-32515
Refueling considerations for liquid-hydrogen fueled vehicles
[DE84-012623] N84-32557
Magnetic switches and circuits, revision 2
[DE84-014141] N84-32725
High-efficiency particulate air filter behavior at high-speed flows
[DE84-014137] N84-32769
Breakdown processes in large-area cold-cathode vacuum triodes
[DE84-014026] N84-32817
Evaluation of bidirectionally conducting thyratrons for pulsed excimer lasers
[DE84-013890] N84-32818

Rapid microbial identification by circular intensity differential scattering
[DE84-013894] N84-32993
MECA: A supercomputer for Monte Carlo
[DE84-014129] N84-33066
Prolonging the life of software
[DE84-001722] N84-33068
High-order sparse factorization methods for elliptic boundary value problems
[DE84-012562] N84-33122
Investigation of an empirical probability measure based test for multivariate normality
[DE84-012626] N84-33135
Monte Carlo estimation under different distributions using the same simulation
[DE84-012438] N84-33136
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013861] N84-33196
Anomalous surface impedance in reentrant ferromagnetic superconductors
[DE84-012634] N84-33230
Dynamical scaling in 3He-4He liquid mixtures
[DE84-010072] N84-33233
Period-doubling 2-torus state in a convecting He-3-superfluid He-4 solution
[DE84-009965] N84-33243
Onset of oscillations in symmetric convective states in a superfluid He-3-He-4 mixture
[DE84-009964] N84-33244
Dynamics of normal-zone propagation in Ta at small currents
[DE84-009990] N84-33245
Some masses for population 1 and 2 cepheids
[DE84-014032] N84-33311
Model for GCR-particle fluxes in stony meteorites and production rates of cosmogenic nuclides
[NASA-CR-173923] N84-33321

LOUISIANA STATE UNIV., BATON ROUGE.
Geomorphic approach to hydrograph synthesis, with potential for application to ungaged watersheds
[PB84-190115] N84-32904

LYON-1 UNIV. (FRANCE).
Canonic measurements in the classic moment problem N84-33041

M

MANCHESTER UNIV. (ENGLAND).
Textile ballistic performance (data base)
[AD-A143249] N84-32541

MARTIN MARIETTA AEROSPACE, DENVER, COLO.
Measurement amplifier
[NASA-CASE-MFS-25868-1] N84-32680

MARTIN MARIETTA CORP., DENVER, COLO.
Teleoperator human factors study
[NASA-CR-173890] N84-33022

MARYLAND UNIV., COLLEGE PARK.
A geographic information system for regional hydrologic modeling N84-32891
Historical and projected shoreline changes: Ocean City and north Assateague Island, Maryland
[PB84-190206] N84-32987
Dynamic programming and transitive closure on linear pipelines
[AD-A143527] N84-33079
A theory of error-based testing
[AD-A143533] N84-33081
Simulation of large networks of processors by smaller ones
[AD-A143529] N84-33098
Frequency response design methods for large scale systems
[DE84-013111] N84-33103
Degrees of adjacency or surroundedness
[AD-A143528] N84-33118
Persistence of the Hopf bifurcation under singular perturbations
[DE84-013871] N84-33120
A study of the temporal and spectral characteristics of gamma ray bursts N84-33331

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Atmospheric propagation effects on infrared radars
[AD-A143196] N84-32651
Three-dimensional circuit layouts
[AD-A143430] N84-32713
Summary of research performed at MIT Laboratory for Computer Science
[AD-A143459] N84-33064
Extending binary Byzantine agreement to multivalued Byzantine agreement
[AD-A143424] N84-33077
Low temperature epitaxial deposition of silicon by plasma enhanced CVD (Chemical Vapor Deposition)
[AD-A143208] N84-33216
Impurity and defect characterization in epitaxial GaAs InP and the ternary and quaternary compound semiconductors
[AD-A143551] N84-33225
Computer simulation of the heavy-duty turbo-compounded diesel cycle for studies of engine efficiency and performance
[NASA-CR-174755] N84-33306
RLE Progress Report no. 126
[RLE-PR-126] N84-33336
Molecule microscopy N84-33337
Semiconductor surface studies N84-33338
Atomic resonance and scattering N84-33339
Chemical reaction dynamics at surfaces N84-33340
X-ray diffuse scattering N84-33341
Phase transitions in chemisorbed systems N84-33342
Optics and quantum electronics N84-33343
Quantum optics and photonics N84-33344
Optical spectroscopy of disordered materials and X-ray scattering from surfaces N84-33345
Infrared nonlinear optics N84-33346
Quantum transport in low dimensional disordered systems N84-33347
Microwave and quantum magnetics N84-33348
Radio astronomy N84-33349
Electromagnetic wave theory and remote sensing N84-33350
Electronic properties of amorphous silicon dioxide N84-33351
Photon correlation spectroscopy and applications N84-33352
Submicron structures technology and research N84-33353
Plasma dynamics N84-33354
Optical propagation and communication N84-33355
Communication networks N84-33356
Digital signal processing N84-33357
Speech communication N84-33358
Linguistics N84-33359
Cognitive information processing N84-33360
Custom integrated circuits N84-33361
Communications biophysics N84-33362
Physiology N84-33363

MATERIALS RESEARCH LABS., MELBOURNE (AUSTRALIA).
Pulsed hydrogen-fluoride laser
[MRL-R-831] N84-32803

MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
A study of leeside flow field heat transfer on Shuttle Orbiter configuration
[NASA-CR-172362] N84-32410

MECHANICAL TECHNOLOGY, INC., LATHAM, N. Y.
Automotive Stirling Engine Development Program. RESD summary report
[NASA-CR-174674] N84-33307

MICHIGAN STATE UNIV., EAST LANSING.
Spatial electron density and electric field strength measurements in microwave cavity experiments
[NASA-CR-173907] N84-32682

MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
Microstructural development and control in liquid phase sintering; processing, structures and properties of cold worked metal matrix composites
[AD-A143188] N84-32509

MICHIGAN UNIV., ANN ARBOR.
Comparison of CRT (Cathode Ray Tube) antireflection filters
[PB84-202753] N84-32742
Thermally induced instabilities of two-layer fluid systems N84-32745
The chemical and physical changes on lubricated surfaces N84-32820
Simplifications in the simulation of mechanisms containing flexible members N84-32855
Remote sensing for geobotanical prospecting N84-32889
Diagensis and deformation of the Madison Group, Colorado and Utah overthrust belt N84-32938
The allocation of data and programs in distributed data processing environments N84-33261
A methodology for the distribution of databases N84-33265
Adaptive subject description in document retrieval N84-33298

MIDWEST RESEARCH INST., GOLDEN, COLO.
CdS/CuInSe2 heterojunction cell research
[DE84-004508] N84-32926
Proceedings of the Solar Thermal-Photochemical Conversion Workshop
[DE84-000089] N84-32929

MINNESOTA UNIV., DULUTH.
Cerebral metabolism and blood brain transport: Toxicity of organophosphorous compounds
[AD-A142705] N84-33005

MINNESOTA UNIV., MINNEAPOLIS.
Simple examples of non linear truss behavior
[AD-A143368] N84-32882

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
System analysis for the Huntsville Operational Support Center distributed computer system
[NASA-CR-171136] N84-33097
Quasiconformal mappings and grid generation
[NASA-CR-173920] N84-33105

MISSISSIPPI STATE UNIV., STATE COLLEGE.
Three-dimensional, time-dependent, compressible, turbulent, integral boundary layer equations in general curvilinear coordinates and their numerical solutions N84-32346
An investigation of a new flight test method for measuring the performance of general aviation aircraft N84-32375

MISSOURI UNIV., COLUMBIA.
Schottky barrier and homojunction gallium arsenide solar cells N84-32907

MITRE CORP., MCLEAN, VA.
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 1: System description and test results
[PB84-184621] N84-32412
Test and evaluation of the Satellite-Aided Maritime Search and Rescue System (SAMSARS). Volume 2: Hardware circuitry and software programs
[PB84-184639] N84-32413

MONSANTO RESEARCH CORP., DAYTON, OHIO.
Passive sampling device for ambient air and personal monitoring
[PB84-210046] N84-32798

MONTANA STATE UNIV., BOZEMAN.
Quantum structure of adsorbates on semiconductor surfaces
[AD-A143465] N84-33223

MOUND LAB., MIAMISBURG, OHIO.
Thermal shock: High temperature high energy rate testing
[DE84-014147] N84-32866

N

NANCY UNIV. (FRANCE).
Fatou theorem for the proper functions of invariant potential operators by a group of Cartan displacements N84-33037

NARCO SCIENTIFIC, HOUSTON, TEX.
Development of engineering prototype of Life Support Module (LSM)
[NASA-CR-171806] N84-33023

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, D. C.
Global Observations and Understanding of the General Circulation of the Oceans
[NASA-CR-173905] N84-32986
Workshop on Systems Analysis
[PB84-194661] N84-33138
Solar-terrestrial data access distribution and archiving
[NASA-CR-173906] N84-33295

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Aeronautical Engineering: A continuing bibliography with indexes (supplement 177)
[NASA-SP-7037(177)] N84-32342
Aeronautical Engineering: A Continuing Bibliography with indexes
[NASA-SP-7037(178)] N84-32343
The NASA photovoltaic technology program
[NASA-TM-83685] N84-32426
Publications of the NASA space biology program for 1980 - 1984
[NASA-TM-86857] N84-32990
Aerospace Medicine and Biology: A continuing bibliography with indexes
[NASA-SP-7011(262)] N84-33003
NASA Patents Abstracts bibliography: A continuing bibliography. Section 2: Indexes (supplement 25)
[NASA-SP-7039(25)-SECT-2] N84-33257
NASA Administrative Data Base Management Systems, 1984
[NASA-CP-2323] N84-33266
Effective organizational solutions for implementation of DBMS software packages N84-33268
Spinoff, 1984
[NASA-TM-85596] N84-33305
Aeronautics and space report of the President, 1983 activities
[NASA-TM-85538] N84-33364

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Improvements in the accuracy and stability of algorithms for the small-disturbance and full-potential equations applied to transonic flows
[NASA-TM-85070] N84-32350

Simulation of transonic separated airfoil flow by finite difference viscous-inviscid interaction
[NASA-TM-85080] N84-32358

Computer studies of hybrid-slotted working sections with minimum interference at subsonic speeds
[NASA-TM-86002] N84-32379

A mathematical simulation model of the CH-46B helicopter, volume 2
[NASA-TM-84351] N84-32380

NASA rotor system research aircraft flight-test data report: Helicopter and compound configuration
[NASA-TM-85843] N84-32381

Air data position-error calibration using state reconstruction techniques
[NASA-TM-86029] N84-32384

A flight-test and simulation evaluation of the longitudinal final approach and landing performance of an automatic system for a light wing loading STOL aircraft equipped with wing spoilers
[NASA-TM-85873] N84-32393

Minimum-fuel, 3-dimensional flightpath guidance of transfer jets
[NASA-TP-2326] N84-32394

Synthesis and characterization of phosphorus-containing polyamides and copolyamides based on 1methyl)-2,4- and -2,6-diaminobenzenes
[NASA-TM-85877] N84-32431

Hygrothermal effects on mechanical behavior of graphite/epoxy laminates beyond initial failure
[NASA-TM-86001] N84-32438

Superfluid helium 2 liquid-vapor phase separation: Technology assessment
[NASA-TM-85868] N84-32752

The structure of the vorticity field in turbulent channel flow. Part 1: Analysis of instantaneous fields and statistical correlations
[NASA-TM-86019] N84-32753

Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11534-1] N84-33021

Second- and third-order upwind difference schemes for hyperbolic conservation laws
[NASA-TM-85059] N84-33106

Strategies for converting to a DBMS environment N84-33267

NASA Ames summary high school apprenticeship research program, 1983 research papers
[NASA-TM-85931] N84-33365

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.

Electronic Switching Spherical Array (ESSA) antenna systems
[NASA-TM-86127] N84-32621

The correction of aberrations computed in the aperture plane of multifrequency microwave radiometer antennas
[NASA-TM-86090] N84-32679

Forecasting of high voltage insulation performance: Testing of recommended potting materials and of capacitors
[NASA-TM-85536] N84-32681

Accuracy of three dimensional solid finite elements N84-32867

Mapping magnetized geologic structures from space: The effect of orbital and body parameters
[E84-10191] N84-32895

Administrative automation in a scientific environment N84-33269

A user view of office automation or the integrated workstation N84-33271

Axions, neutrinos and strings: The formation of structure in an SO(10) universe
[NASA-TM-86139] N84-33317

A geographic comparison of selected large-scale planetary surface features
[NASA-TM-86147] N84-33320

Expressions to determine temperatures and emission measures for solar X-ray events from GOES measurements
[NASA-TM-86142] N84-33325

Microwave and X-ray observations of delayed brightenings at sites remote from the primary flare locations
[NASA-TM-86140] N84-33326

Three precise gamma-ray burst source locations
[NASA-TM-86132] N84-33332

The broad-band X-ray spectrum of a QSO sample
[NASA-TM-85071] N84-33333

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.

Foldable self-erecting joint
[NASA-CASE-MSC-20635-1] N84-32424

Multi-leg heat pipe evaporator
[NASA-CASE-MSC-20812-1] N84-32748

Linear motion valve
[NASA-CASE-MSC-20148-1] N84-32823

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. JOHN F. KENNEDY SPACE CENTER, COCOA BEACH, FLA.

The administrative window into the integrated DBMS N84-33270

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.

Subsonic and transonic unsteady- and steady-pressure measurements on a rectangular supercritical wing oscillated in pitch
[NASA-TM-85765] N84-32348

Fast solutions to the steady state compressible and incompressible fluid dynamic equations
[NASA-CR-172416] N84-32349

Experience with transonic unsteady aerodynamic calculations
[NASA-TM-86278] N84-32353

Fuselage and nozzle pressure distributions of a 1/12-scale F-15 propulsion model at transonic speeds. Effect of fuselage modifications and nozzle variables
[NASA-TP-2333] N84-32354

Lightning swept-stroke attachment patterns and flight conditions for storm hazards 1981
[NASA-TM-86279] N84-32365

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[NASA-TP-2353] N84-32378

Aircraft liftmeter
[NASA-CASE-LAR-12518-1] N84-32383

Structural performance of orthogonal tetrahedral truss Space-Station configurations
[NASA-TM-86260] N84-32422

Hole interaction and load introduction effects for compression-loaded laminates with holes
[NASA-TM-86287] N84-32435

Failure analysis of a graphite/epoxy laminate subjected to bolt bearing loads
[NASA-TM-86297] N84-32436

A study of the effects of end-cap molecular species on environmental characteristics of polimidesulfones
[NASA-TM-86283] N84-32437

A simple rectangular element for 2-dimensional analysis of laminated composites
[NASA-TM-86291] N84-32439

A system for controlling the oxygen content of a gas produced by combustion
[NASA-CASE-LAR-13257-1] N84-32447

Response of Inconel 617 superalloy to combined ground-based and STS reentry exposure
[NASA-TM-86293] N84-32505

Residual mechanical properties of Ti-6Al-4V after simulated Space Shuttle reentry
[NASA-TM-86294] N84-32506

Effect of alloy chemistry and exposure conditions on the oxidation of titanium
[NASA-TM-86295] N84-32507

Structural pressure sensitive silicone adhesives
[NASA-CASE-LAR-13270-1] N84-32532

Technique for measuring gas conversion factors
[NASA-CASE-LAR-13220-1] N84-32786

Volumetric fuel quantity gauge
[NASA-CASE-LAR-13147-1] N84-32787

Aircraft landing dynamics facility carriage weld test program
[NASA-TM-85802] N84-32827

Opening of an interface flaw in a layered elastic half-plane under compressive loading
[NASA-TM-86282] N84-32877

Proceedings of a Workshop on Polar Stratospheric Clouds: Their Role in Atmospheric Processes
[NASA-CP-2318] N84-32952

Summary of research in applied mathematics, numerical analysis and computer science at the Institute for Computer Applications in Science and Engineering
[NASA-CR-172421] N84-33024

The well-posedness of the Kuramoto-Sivashinsky equation
[NASA-CR-172431] N84-33053

On the impact of communication complexity in the design of parallel numerical algorithms
[NASA-CR-172436] N84-33059

Parameter estimation for the Euler-Bernoulli beam
[NASA-CR-172417] N84-33107

The exponential accuracy of Fourier and Tchebyshev differencing methods
[NASA-CR-172435] N84-33108

On accuracy conditions for the numerical computation of waves
[NASA-CR-172433] N84-33111

Numerical solutions of acoustic wave propagation problems using Euler computations
[NASA-CR-172434] N84-33112

The time evolution of spectral discretizations of hyperbolic systems
[NASA-CR-172432] N84-33113

Langley experience with ADABAS/NATURAL N84-33272

Strip and load data N84-33273

NATURAL graphics N84-33274

Asynchronous file transfer to IBM PC's N84-33275

Status tracking system for reports N84-33276

NASA metrology information system: A NEMS subsystem N84-33279

Langley's views on NEMS N84-33280

LaRC local area networks to support distributed computing N84-33281

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Summary of recent NASA propeller research
[NASA-TM-83733] N84-32344

Unsteady transonic flow in cascades
[NASA-TM-83780] N84-32351

Investigation of the three-dimensional flow field within a transonic fan rotor: Experiment and analysis
[NASA-TM-83739] N84-32357

Analytical and experimental investigation of stator endwall countouring in a small axial-flow turbine
[NASA-TP-2309] N84-32388

A high energy stage for the National Space Transporation System
[NASA-TM-83795] N84-32411

Improved heat exchanger for electrothermal devices
[NASA-CASE-LEW-14037-1] N84-32425

Preliminary design of a 10-kW thermophotovoltaic system for space applications
[NASA-TM-83768] N84-32427

GCKP84-general chemical kinetics code for gas-phase flow and batch processes including heat transfer effects
[NASA-TP-2320] N84-32446

Microstructure and surface chemistry of amorphous alloys important to their friction and wear behavior
[NASA-TM-83762] N84-32508

The friction behavior of semiconductors Si and GaAs in contact with pure metals
[NASA-TM-83779] N84-32531

RF sputtered silicon and hafnium nitrides as applied to 440C steel
[NASA-TM-86862] N84-32536

The 20 x 20 high speed microwave switches
[NASA-TM-83775] N84-32644

A study of the high frequency limitations of series resonant converters
[NASA-CR-173868] N84-32678

Piezoelectric deicing device
[NASA-CASE-LEW-13773-2] N84-32782

Structural design of a vertical antenna boresight 18.3 by 18.3-m planar near-field antenna measurement system
[NASA-TM-83781] N84-32783

Characteristics and capacities of the NASA Lewis Research Center high precision 6.7- by 6.7-m planar near-field scanner
[NASA-TM-83785] N84-32789

Thermal analysis of a planetary transmission with spherical roller bearings operating after complete loss of oil
[NASA-TP-2367] N84-32824

Characterization of erosion of metallic materials under cavitation attack in a mineral oil
[NASA-TP-2368] N84-32825

The role of the reflection coefficient in precision measurement of ultrasonic attenuation
[NASA-TM-83788] N84-32849

Negative electrode catalyst for the iron-chromium REDOX energy storage system
[NASA-CASE-LEW-14028-1] N84-32909

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

Warm fog dissipation using large volume water sprays
[NASA-CASE-MFS-25982-1] N84-32396

Containerless high purity pulling process and apparatus for glass fibers
[NASA-CASE-MFS-25905-2] N84-32569

Measurement amplifier
[NASA-CASE-MFS-25868-1] N84-32680

Mesoscale observations of lightning from Space Shuttle
[NASA-TM-86451] N84-32788

Laser furnace technology for zone refining
[NASA-TM-86459] N84-32805

Materials testing of the IUS techroll seal material
[NASA-TM-86462] N84-32829
Bi-directional control system for energy flow in a solar powered flywheel
[NASA-CASE-MFS-25978-1] N84-32913
Computer vision for real-time orbital operations. Center directors discretionary fund
[NASA-TM-86457] N84-33076

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.
Stabilized unsaturated polyesters
[NASA-CASE-NPO-16103-1] N84-32530
Synchronization tracking in pulse position modulation receiver
[NASA-CASE-NPO-16256-1] N84-32620
Stable density stratification solar pond
[NASA-CASE-NPO-15419-2] N84-32910
A new solar cell design for improved open circuit voltage and high efficiency
[NASA-CASE-NPO-16126-1] N84-32911
Solar-heated oil shale retort
[NASA-CASE-NPO-16392-1] N84-32912
Low loss splicing method for single-mode optical fiber
[NASA-CASE-NPO-16294-1] N84-33179
FET charge sensor and voltage probe
[NASA-CASE-NPO-16045-1] N84-33211

NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).
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[AGARD-AR-193] N84-32402

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.
I/O channel interface
[NBS-FIPS-PUB-60-2] N84-33057
The NBS data management technology program N84-33277
Liquified natural gas densities: Summary of research program at the National Bureau of Standards
[PB84-202647] N84-33297

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.
Studies in climate
[PB84-190385] N84-32977
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Goals and activities of the National Commission on Libraries and Information Science
[ISSN-0091-2972] N84-33282
A decade of accomplishment
[ISSN-0091-2972] N84-33283

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The Levi problem for cohomology classes N84-33032

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[PB84-204569] N84-32978

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[PB84-210244] N84-32667

NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON, D. C.
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[PB84-910407] N84-32368

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Electrical and differential scanning calorimetry studies of poly(ethylene oxide) complexed with alkaline earth thiocyanates
[AD-A143198] N84-32449
Association and bound motion in alkali metal doped cadmium fluoride
[AD-A143200] N84-32450
NMP, electrical relaxation, and high pressure electrical conductivity in ion conducting polymers
[AD-A143202] N84-32451
Electrically conducting poly(vinyl acetate)
[AD-A143199] N84-32538
Anomalous pressure dependence of dipolar relaxation times in rare earth doped lead fluoride
[AD-A143201] N84-33215

NAVAL BIODYNAMICS LAB., NEW ORLEANS, LA.
Photodigitizing procedures
[AD-A143589] N84-32793

NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
Preliminary guidelines for maintenance of polyurethane foam (PUF) roofing systems
[AD-A143458] N84-32543
Fuel cell power systems for Navy applications
[AD-A143402] N84-32923

NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY, BAY ST. LOUIS, MISS.
Hydrographic measurements in the western Arlboran Sea, October 1982
[AD-A143588] N84-32985

NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.
The least squares lattice algorithm: An alternate derivation with a discussion of numerical conditioning
[AD-A143439] N84-33114

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Radiation from intense electron beams associated with the Cherenkov mechanism
[AD-A143350] N84-32657
Representation of potential flow about axisymmetric bodies with discrete singularities
[AD-A143526] N84-32760
Report of tests of a compressor configuration of CD (Controlled Diffusion) blading
[AD-A143499] N84-32832
Use of the tensor product for numerical weather prediction by the finite element method, part 1
[AD-A143273] N84-32970
Time development of Cerenkov radiation
[AD-A143225] N84-33155

NAVAL RESEARCH LAB., WASHINGTON, D. C.
Liquid and solid phase compositions in a partially frozen jP-5 fuel low in n-alkanes
[AD-A143390] N84-32553
Length distribution of chords through a rectangular volume
[AD-A143302] N84-32654
Passive line-of-sight stabilization for an infrared sensor
[AD-A143305] N84-32792
An entropy maximum principle and instantaneous failure statistics
[AD-A143299] N84-32851
Aerosol measurements at an optical propagation site on the Outer Hebrides
[AD-A143564] N84-32972
Determination of sea surface temperature with N-ROSS (Navy-Remote Ocean Sensing System)
[AD-A143563] N84-32984
Angular resolution of coherent and noncoherent sources
[AD-A143267] N84-33129
Point response functions for unfilled optical arrays
[AD-A143384] N84-33183
Modified Thomson parabola ion spectrometers for use in laser generated plasma experiments
[AD-A143298] N84-33190
Influence of magnetic shear on the collisional current driven ion cyclotron instability
[AD-A143391] N84-33191
An entropy maximum principle and relaxation phenomena
[AD-A143531] N84-33250

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, ANNAPOLIS, MD.
Friction and wear studies of liquid metal wetted, metallic fiber brushes
[AD-A143473] N84-32631

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Finite element prediction of acoustic scattering and radiation from submerged elastic structures N84-32874

NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CONN.
High-frequency acoustic backscatter from the sea surface
[AD-A143536] N84-33152

NAVAL WAR COLL., NEWPORT, R. I.
The feasibility, practicality and utility of P-3 inflight refueling
[AD-A143419] N84-32382

NEBRASKA UNIV., LINCOLN.
Optical and electrical properties of organic dye crystals
[DE84-014930] N84-33240

NEW MEXICO STATE UNIV., LAS CRUCES.
Antenna performance verification at launch site. A feasibility study on preflight performance testing of stripline slot arrays mounted on a rocket
[AD-A143266] N84-32653

NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA).
An extension of deLeeuw's theorem to the N-dimensional rotation group N84-33046

NEW YORK UNIV., NEW YORK.
Analysis of three-dimensional transonic compressors
[NASA-CR-166580] N84-32356
Concurrency control using locks in distributed databases N84-33262

NORTH CAROLINA STATE UNIV., RALEIGH.
Physical properties of CdTe films grown by hotwall and molecular beam techniques
[AD-A143180] N84-33214

NORTH CAROLINA UNIV., CHAPEL HILL.
Subgroups of continuous groups acting differentiably on the half-line N84-33028

NORTHEASTERN UNIV., BOSTON, MASS.
Remote data acquisition system
[AD-A143347] N84-32419

NORTHROP SERVICES, INC., RESEARCH TRIANGLE PARK, N. C.
Dosimetry of ozone and nitrogen dioxide in man and animals
[PB84-195304] N84-33009

NORTHWESTERN UNIV., EVANSTON, ILL.
On the mechanics of fatigue crack growth due to contact loading N84-32859
Defect clusters and electrical properties in transition metal monoxides
[DE84-014851] N84-33242
Deduction in nonhorn databases N84-33263

NOXSO CORP., PADUCAH, KY.
Adsorbent regenerator
[DE84-012969] N84-32468

O

OAK RIDGE GASEOUS DIFFUSION PLANT, TENN.
Ekman boundary conditions for numerical models of centrifuge flows
[DE84-013576] N84-32765

OAK RIDGE NATIONAL LAB., TENN.
Chemical vapor deposition of erosion resistant TiB-2 coatings
[DE84-012351] N84-32518
Ion bombardment damage in a modified Fe-9Cr-1Mo steel
[DE84-014268] N84-32522
INTERMD: A computer program to predict intermodulation product generation on two-way FM radio frequencies
[DE84-013767] N84-32661
Current assessment of the potential of dielectric gas mixtures for industrial applications
[DE84-011658] N84-32724
Development of advanced thermal insulation for appliances
[DE84-013132] N84-32763
Microstructural analysis for series 300 stainless steel sheet welds and tensile samples
[DE84-006513] N84-32837
Algorithms for error localization of discrete data
[DE84-014417] N84-33089
Reliability of initial-value MHD calculations of Tokamak disruptions
[DE84-013600] N84-33193

Accelerated convergence of the steepest-descent method for magnetohydrodynamic equilibria
[DE84-013802] N84-33195
Synergistic effects in plasma surface interactions
[DE84-012346] N84-33199
Propagation and absorption of electromagnetic waves in fully relativistic plasmas
[DE84-013827] N84-33204

OAKLAND UNIV., ROCHESTER, MICH.
Development of shearography for nondestructive testing of highway structure
[PB84-187244] N84-32577

OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).
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[AD-A143238] N84-33287
Physics in Europe: A data file of selected research
[AD-A143428] N84-33289

OHIO STATE UNIV., COLUMBUS.
New gallium precursors for the formation of high purity gallium arsenide by metal organic vapor phase deposition
[AD-A143361] N84-33219

OKLAHOMA STATE UNIV., STILLWATER.
Detection of damage in hydraulic components by acoustic emission techniques
[AD-A143262] N84-32850

OKLAHOMA UNIV., NORMAN.
Multi-valued LSI/VLSI logic design N84-32670

OLD DOMINION UNIV., NORFOLK, VA.
Visual information transfer. 1: Assessment of specific information needs. 2: The effects of degraded motion feedback. 3: Parameters of appropriate instrument scanning behavior
[NASA-CR-173913] N84-33020

OREGON STATE UNIV., CORVALLIS.
Calculation of the pressure distribution on a pitching airfoil with application to the Darrieus rotor
[DE84-013571] N84-32363
Paleomagnetism, rock magnetism and diagenesis in hemipelagic sediments from the northeast Pacific Ocean and the Gulf of California N84-32944

OREGON UNIV., EUGENE.
Relativistic calculations and measurements of energies, Auger rates, and lifetimes
[AD-A143423] N84-33220

OTTAWA UNIV. (ONTARIO).
Studies of the electric field distribution in biological bodies: Experimental dosimetry at radio frequencies
[AD-A143507] N84-32992

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Large HAWT (Horizontal-Axis Wind Turbine) wake measurement and analysis
[DE84-013269] N84-32772
Develop real-time dosimetry concepts and instrumentation for long-term missions
[NASA-CR-171809] N84-32791
Verification of hourly forecasts of wind turbine power output
[PNL-4900] N84-32914
Wind shear for large wind turbine generators at selected tall tower sites
[DE84-011790] N84-32974
Basic principles and recent observations of rotationally sampled wind
[DE84-013267] N84-32976
Basic geometric algorithms for use with graphic input
[DE84-013256] N84-33090
Aircraft, ships, spacecraft, nuclear plants and quality
[DE84-013262] N84-33166

PARIS-SUD UNIV., ORSAY (FRANCE).
The Fourier Plancherel transform for Lie groups. 2: Nilpotent groups N84-33026
Characterizations of zeros in the functions of some Nevanlinna type classes in the bidisk N84-33029
Uniqueness in the Cauchy problem for second order operators with real symbols N84-33045
Bounded Hessian functions N84-33048

PARIS VI UNIV. (FRANCE).
Analytic automorphisms of a bounded Reinhardt domain in a complex Banach space with base N84-33044
Brownian motion and random walks on manifolds N84-33051

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
A theoretical and experimental study of turbulent evaporating sprays
[NASA-CR-174760] N84-32390
The effects of porous material on microbubble skin friction reduction
[AD-A143401] N84-32756
Heat transfer, fluid flow and element vaporization in laser welding
[DE84-011783] N84-32839

PENNSYLVANIA UNIV., PHILADELPHIA.
High-level operations in nonprocedural programming languages
[AD-A143470] N84-33078

PHILIPS MEDICAL SERVICE, EINDHOVEN (NETHERLANDS).
Review of occupational medicine relevant to aviation medicine N84-33012

PHOTOMETRICS, INC., WOBURN, MASS.
Turbulent diffusion, dissipation, and winds from calibrated photographs of artificial clouds
[AD-A143231] N84-32956
Experiments on interaction of keV particle beams with the ionosphere
[AD-A143277] N84-32957

PHYSICAL SCIENCES, INC., ANDOVER, MASS.
Molten carbonate fuel cell performance model update
[DE84-012932] N84-32733

PITTSBURGH UNIV., PA.
A finite element implementation of the dual variable method for the Navier-Stokes equations N84-32746
Computational fluid dynamics at the ICMA (Institute of Computational Mathematics and Applications)
[AD-A143510] N84-32759
Horizontal cylindrical vessels supported by saddles subjected to vertical and lateral force fields N84-32858
Chemical reactions, radiative and energy transfer processes of important atmospheric species
[AD-A143264] N84-33156
Predictions of satisfaction with automated library circulation systems N84-33259
Photoionization models of the MgII and CIV selected clouds observed in absorption in QSO spectra N84-33314

POLITECNICO DI MILANO (ITALY).
Nonlinear burning stability of solid propellants
[AD-A143573] N84-32554

POLYATOMICS RESEARCH, INC., MOUNTAIN VIEW, CALIF.
Theoretical research program to predict the properties of molecules and clusters containing transition metal atoms
[NASA-CR-173924] N84-32502

PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
Turbine blade and vane heat flux sensor development, phase 1
[NASA-CR-168297] N84-32790

PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD, CONN.
Energy efficient engine component development and integration program
[NASA-CR-173684] N84-32389

PRINCETON UNIV., N. J.
Investigation of the external flow analysis for density measurements at high altitude
[NASA-CR-173861] N84-32352
The transformation of liquid to amorphous solid: The time to vitrify for styrene polymerization
[AD-A143228] N84-32452
Robust C(Alpha)-type tests for linear models
[AD-A143177] N84-33125
Bounded-influence inference in regression
[AD-A143195] N84-33126
Robust model selection in regression
[AD-A143209] N84-33127

PUERTO RICO UNIV., MAYAGUEZ.
Two phase system; interfacial turbulence
[AD-A143182] N84-32754

PULSE SCIENCES, INC., SAN LEANDRO, CALIF.
Pulsed power for racetrack induction accelerators
[AD-A143299] N84-33157

PURDUE UNIV., LAFAYETTE, IND.
Linearized dynamical model for the NASA/IEEE SCOLE configuration
[NASA-CR-172394] N84-32423
Multicomponent diffusion under general chemical potential gradients
[DE84-010830] N84-32458
LANDSAT-4 image data quality analysis
[E84-10173] N84-32893
The Blue CHIP Project
[AD-A143474] N84-33065
The prediction of acoustical particle motion using an efficient polynomial curve fit procedure
[NASA-CR-173915] N84-33145
A study of methods to predict and measure the transmission of sound through the walls of light aircraft. A survey of techniques for visualization of noise fields
[NASA-CR-173917] N84-33146

R

RADIAN CORP., DURHAM, N.C.
Locating and estimating air emissions from sources of acrylonitrile
[PB84-200609] N84-32934

RAND CORP., SANTA MONICA, CALIF.
Using statistical tools
[RAND/N-2121-PSSP] N84-33124
Rand's experience in applying artificial intelligence techniques to strategic-level military-political war gaming
[P-6977] N84-33137
Interactive information environments: A plan for enabling interdisciplinary research
[RAND/N-2115] N84-33284
Scientific and technical information transfer: Issues and options
[RAND/N-2131-NSF] N84-33286

REEVES (C. RICHARD), AUSTIN, TEX.
High efficiency heat pump using ground heat source
[DE84-006385] N84-32761

REGIONAL PLANNING COUNCIL, BALTIMORE, MD.
Scenario planning: Energy considerations in the long range urban transportation planning process
[DE84-013590] N84-33308

RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Mass transfer from a circular cylinder: Effects of flow unsteadiness and slight nonuniformities
[NASA-CR-174759] N84-32751
Non-destructive testing of semiconductors using surface acoustic wave
[AD-A143559] N84-33228

RICE UNIV., HOUSTON, TEX.
Supersonic metal cluster beams
[DE84-012976] N84-32516
Optional stopping performance under graphic and numeric CRT formatting
[AD-A143274] N84-32712

ROCHESTER UNIV., N. Y.
Formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules
[AD-A143552] N84-33226

ROCKETDYNE, CANOGA PARK, CALIF.
Retardation analytical model to extend service life
[NASA-CR-173891] N84-32662

ROCKWELL INTERNATIONAL CORP., ANAHEIM, CALIF.
Maximum supercooling in liquid 3He-4He mixtures near the tricritical point
[DE84-010076] N84-33232

ROCKWELL INTERNATIONAL CORP., GOLDEN, COLO.
Design of a digital telemetry data collection system
[DE84-013916] N84-32420

ROCKWELL INTERNATIONAL CORP., PITTSBURGH, PA.
Transient response dynamic module modifications to include static and kinetic friction effects N84-32872

ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
Processing science to increase the reliability of ceramics
[AD-A143207] N84-32539

ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
HF prediction using adiabatic invariant theory
[AD-A143239] N84-32652
Broadside radar cross section of the perfectly conducting cube
[AD-A143321] N84-32656
Preparation of high purity Ga(X)In(1-x) by the VPE-hydride method with a gallium-indium alloy source
[AD-A143275] N84-33218

ROUEN UNIV. (FRANCE).
Conformal mapping and almost Lipschitzian curves N84-33040

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Practical problems with CO2 laser radar tests
[RAE-TRANS-2113] N84-32804
Oxygen affinity of hemoglobin, 3 hours after passive increase in altitude from 400 to 1600 metres
[RAE-TRANS-2118] N84-33004

ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
A compact frequency-stable pulsed CO-2 laser
[AD-A143216] N84-32606

RPK CORP., ATHENS, GA.
The design and usage of the new data management features in NASTRAN N84-32666
COSMIC/NASTRAN on the Cray computer systems N84-32668

S

SANDIA LABS., ALBUQUERQUE, N. MEX.
Highly sensitive high resolution Raman spectroscopy using resonant ionization methods
[DE84-012240] N84-32460
Dielectric breakdown distributions of large dielectric constant liquids
[DE84-013216] N84-32461
Physical techniques for profiling heterogeneous polymer degradation
[DE84-013607] N84-32547
Effect of thermal aging on the output of a pyrotechnic actuator
[DE84-012903] N84-32558
Optical fiber termination and splicing techniques
[DE84-013919] N84-32572
Ampule tests to simulate glass corrosion in ambient temperature lithium batteries, volume 2
[DE84-014330] N84-32732
Review of flow battery testing at Sandia
[DE84-011186] N84-32734
A 50 kJ repetitively pulsed capacitor bank
[DE84-012959] N84-32735
Least-squares smoothing of direct-exchange in zonal analysis
[DE84-002612] N84-32770
Rectangular heat source on a semi-infinite solid: An analysis of a thin film heat flux gage
[DE84-012234] N84-32796
Failure prediction of notched pressure vessels using the CTOD approach
[DE84-013057] N84-32883
Computer system for fiber creep testing
[DE84-014453] N84-32885
Thermal modeling of line focus photovoltaic systems
[DE84-013920] N84-32927
Concentrating photovoltaic technology
[DE84-012275] N84-32931
Solving low density knapsacks
[DE84-006964] N84-33085
Some practical Runge-Kutta formulas
[DE84-013539] N84-33123
Asymptotic relative efficiencies of the rank transformation procedure in randomized complete block designs
[DE84-010600] N84-33134
Experimental investigation of certain beam transport issues in a pulsed transmission line linear accelerator
[DE84-011191] N84-33184

SARKARIA (K. S.), CHANDIGARH (INDIA).
Non-degenerescence of some spectral sequences
N84-33027

SCHNEIDER (JOS.) OPTISCHE WERKE A.G., BAD KREUZNACH (WEST GERMANY).
Graphical error analysis
[BMFT-FB-T-84-081] N84-33093

SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Measurement of specific absorption rate in human phantoms exposed to simulated Air Force radar emissions
[AD-A143570] N84-33007

SCIENCE APPLICATIONS, INC., DAYTON, OHIO.
Development of color criteria for advanced displays
[AD-A143246] N84-33006

SCIENCE APPLICATIONS, INC., MCLEAN, VA.
Parts on demand: Evaluation of approaches to achieve flexible manufacturing systems for Navy parts on demand, volume 1
[AD-A143248] N84-32830

SEATTLE UNIV., WASH.
Identification of gamma-ray lines observed from SS433
[DE84-013629] N84-33335

SHERBROOKE UNIV. (QUEBEC).
Dynamics of heat, mass and momentum transfer in an inductively coupled plasma
[DE84-013499] N84-33200
Plasma-particle interaction effects in induction plasma modelling under dense loading conditions
[DE84-013388] N84-33203

SIMULA, INC., TEMPE, ARIZ.
Development of 2 underseat energy absorbers for application to crashworthy passenger seats for general aviation aircraft
[NASA-CR-158927] N84-32367

SKF INDUSTRIES, INC., KING OF PRUSSIA, PA.
Mechanical interactions of rough surfaces
[DE84-014097] N84-32841
Solid lubrication design methodology
[NASA-CR-174690] N84-33309

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Measurement of H2O and other trace gases in the stratosphere using a high resolution far-infrared spectrometer at 26 km
[NASA-CR-173879] N84-32951
Dynamic model of the Earth's upper atmosphere
[NASA-CR-3835] N84-32965
Research relative to high energy astrophysics
[NASA-CR-173878] N84-33315

SOFTECH, INC., WALTHAM, MASS.
ADA (trademark) training curriculum. Programming methodology m203 teacher's guide
[AD-A143581] N84-33082
ADA (trademark) training curriculum. Basic ADA programming l202 teacher's guide, volume 1
[AD-A143584] N84-33083
ADA (trademark) training curriculum. Basic ADA programming l202 teacher's guide, volume 2
[AD-A143585] N84-33084

SOLAR TURBINES INTERNATIONAL, SAN DIEGO, CALIF.
High temperature metallic recuperator
[PB84-207869] N84-32575

SOLAREX CORP., ROCKVILLE, MD.
Is structural interface standardization beneficial?
N84-32702

SOUTHAMPTON UNIV. (ENGLAND).
Engineering changes to the 0.1m cryogenic wind tunnel at Southampton University
[NASA-CR-172430] N84-32397

SOUTHERN METHODIST UNIV., DALLAS, TEX.
Sensor noise and Kalman filter for aided inertial navigation system
[AD-A143360] N84-32372

SOUTHERN RESEARCH INST., BIRMINGHAM, ALA.
Mathematical model of electrostatic precipitation (revision 3). Volume 1: Modeling and programming
[PB84-212679] N84-32469
Mathematical model of electrostatic precipitation (revision 3). Volume 2: User's manual
[PB84-212687] N84-32470

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
A research study of the assessment of escape impairment by irritant combustion gases in postcrash aircraft fires
[FAA-CT-84-16] N84-32366
Engine wear with methanol fuel in a nitrogen-free environment
[AD-A143530] N84-32633

SPACE POWER, INC., SUNNYVALE, CALIF.
Thermionic conversion reactor technology assessment
[DE84-007611] N84-33168

SPERRY FLIGHT SYSTEMS, PHOENIX, ARIZ.
Conceptual design of a noncontacting power transfer device for the ASPS Vernier system
[NASA-CR-172238] N84-32677

SPERRY GYROSCOPE CO., CLEARWATER, FLA.
Radio frequency distribution assembly
[AD-A143575] N84-32658

SPERRY SYSTEMS MANAGEMENT, HUNTSVILLE, ALA.
COSMIC/NASTRAN free-field input N84-32665

SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Artificial Intelligence-Robotics applications to Navy aircraft maintenance
[AD-A143219] N84-32345

STANFORD LINEAR ACCELERATOR CENTER, CALIF.
A 1-dimensional disk model simulation for klystron design
[DE84-013793] N84-32727
Implicit function method for the Liouville equation
[DE84-013282] N84-33140
Future of high energy physics
[DE84-013513] N84-33165

STANFORD UNIV., CALIF.
Studies in a transonic rotor aerodynamics and noise facility
[NASA-CR-166588] N84-32399
Laser physics and laser techniques
[AD-A143538] N84-32609
Cyclotron resonant scattering of energetic electrons by electromagnetic waves in the magnetosphere
N84-32946
S-1 software development and maintenance
[DE84-013071] N84-33091
Duality in inexact fractional programming with set-inclusive constraints
[DE84-023584] N84-33092
Distribution results for positive definite quadratic forms with repeated roots
[AD-A143450] N84-33115
Relationships among classes of spherical matrix distributions
[AD-A143215] N84-33126
Variability orderings related to coverage problems on the circle
[AD-A143364] N84-33130
Diamond surface: Atomic and electronic structure
[DE84-013518] N84-33234

STATE UNIV. OF NEW YORK, BUFFALO.
Random multiple access methods in multi-user communication systems N84-32616
Stresses and displacements in linear Maxwell non-isothermal circular plates on Winkler foundation and with radial and transverse variation in material properties
N84-32656

STOCKHOLM UNIV. (SWEDEN).
On the closure of spaces of sums of ridge functions and the range of the X-ray transform N84-33035

SYRACUSE UNIV., N. Y.
Crack tip field and fatigue crack growth in general yielding and low cycle fatigue
[NASA-CR-174666] N84-32503
Computer calculated analysis of subsurface formation porosities in central New York state N84-32941
Spherically symmetric radiation in gravitational collapse N84-33312

T

TATA INST. OF FUNDAMENTAL RESEARCH, BOMBAY (INDIA).
Harmonic maps from S-2 to IHP-2 N84-33109

TEL-AVIV UNIV. (ISRAEL).
Dynamics of large molecules and molecular clusters
[AD-A143366] N84-32542
Manipulation of the mixing process between streams of different velocity and temperature in the presence of pressure gradient
[AD-A143467] N84-32757

TELEDYNE GEOTECHNICAL, GARLAND, TEX.
Development of the model 52500 strain-inertial seismometer system (prototype)
[AD-A143572] N84-32961

TENNESSEE EASTMAN CORP., OAK RIDGE.
Structural analysis of the support system for a large compressor driven by a synchronous electric motor
N84-32673

TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE.
Cleavage of aromatic carbon-carbon bonds
[DE84-010161] N84-32432
One-sided r-reliable intervals and their associated confidences on the sum of two Continuous/Independent, random variables
[AD-A143387] N84-33131

TEXAS A&M UNIV., COLLEGE STATION.
Design of a composite wing extension for a general aviation aircraft
[NASA-CR-173832] N84-32377
Development and characterization analysis of a radar polarimeter
[NASA-CR-175259] N84-32785
Intermediate-energy nuclear theory
[DE84-012971] N84-33161
High energy physics research at Texas Agriculture and Mining University
[DE84-011616] N84-33167
An exploratory analysis of the relationship between media richness and managerial information processing
[AD-A143503] N84-33293

TEXAS TECHNOLOGICAL UNIV., LUBBOCK.
Feedback systems and simultaneous design
[AD-A143547] N84-33102

TEXAS UNIV., AUSTIN.
Fatigue behavior of longitudinal transverse stiffener intersection
[PB84-202092] N84-32987
Fatigue behavior of welded joints subjected to variable amplitude stresses
[PB84-207620] N84-32888
The effect of queueing disciplines on response times in distributed systems
[DE84-012639] N84-33086
Relative motion characteristics of 2 near-Earth Satellites
[NASA-CR-173867] N84-33316

TOHOKU UNIV., SENDAI (JAPAN).
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[ISSN-0385-7719] N84-32565
A study on accurate frequency-control of semiconductor lasers N84-32566
On applications of a specification and description language NESDEL to communication protocols
N84-32567
An automatic syntheses of hardware algorithm
N84-32568

TOSHIBA RESEARCH AND DEVELOPMENT CENTER, KAWASAKI (JAPAN).
A 1-dimensional disk model simulation for klystron design
[DE84-013793] N84-32727

TOULOUSE UNIV. (FRANCE).
Serre's spectral sequence and homotopy N84-33050

TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
Thunderstorm impact on Denver air traffic control operations and the role of NEXRAD (Next Generation Weather Radar)
[PB84-180729] N84-32374

TRW, INC., REDONDO BEACH, CALIF.
Development of partially fluorinated resin apex seals
[NASA-CR-174706] N84-32828
The 1.4 gb/s optical repeater development
[AD-A143331] N84-33182

U

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, RISLEY (ENGLAND).
Gas chromatographic analysis of nitrogen
[BLL-RISLEY-TRANS-4563-(9091.9)] N84-32443
Weldability of steels: Study of cracking and methods of examination
[BLL-RISLEY-TRANS-4519-(9091.9)] N84-32475
Stress corrosion cracking of stainless steels in sea water at ambient temperature
[BLL-RISLEY-TRANS-4556-(9091.9)] N84-32476
Chromium-magnesium stainless steels, resistant to stress corrosion cracking in magnesium and calcium chloride solutions
[BLL-RISLEY-TRANS-4571-(9091.9)] N84-32477
Stress corrosion cracking of austenitic stainless steels in sea water: An investigation of test methods
[BLL-RISLEY-TRANS-4568-(9091.9)] N84-32478
Procedure for the electroplating of sintered materials containing carbide or cast alloys of tungsten, molybdenum, titanium or zirconium
[BLL-RISLEY-TRANS-4557-(9091.9)] N84-32484
Robotisation of dye penetrant inspection: A study of a prototype and its development
[BLL-RISLEY-TRANS-4585-(9091.9)] N84-32847
Eddy current testing of steam generator tubes
[BLL-RISLEY-TRANS-4584-(9091.9)] N84-32848

UNITED TECHNOLOGIES CORP., EAST HARTFORD, CONN.
Materials for Advanced Turbine Engines (MATE): Project 3: Design, fabrication and evaluation of an oxide dispersion strengthened sheet alloy combustor liner
[NASA-CR-174691] N84-32504

UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
A linear aerodynamic analysis for unsteady transonic cascades
[NASA-CR-3833] N84-32355

UNIVERSIDADE FEDERALE DO RIO GRAND DO SUL, PORTO ALEGRE (BRAZIL).
Thermal instabilities in the edge region of reversed-field pinches
[DE84-013861] N84-33196

UNIVERSITE DE FRANCHE-COMTE, BRESANCON (FRANCE).
Infinitesimal L-classes of a group of algebraic numbers N84-33039

UNIVERSITY OF NORTHERN ILLINOIS, DE KALB.
Studies of structural properties and their relationship to critical parameters in superconducting materials
[AD-A143556] N84-33227

UPPSALA UNIV. (SWEDEN).
The growth of plurisubharmonic functions in infinite domain N84-33033

URBAN MASS TRANSPORTATION ADMINISTRATION, WASHINGTON, D.C.
Microcomputers in transportation: Software and source book
[PB84-195155] N84-33067

UTAH UNIV., SALT LAKE CITY.
Effect of processing conditions on the reliability of crosslinked polyethlene cable insulation
[DE84-014902] N84-32546
Carbon-13 and proton nuclear magnetic resonance analysis of shale-derived refinery products and jet fuels and of experimental referee broadened-specification jet fuels
[NASA-CR-174761] N84-32552

V

VERMONT UNIV., BURLINGTON.
Influence of the interfacial layer on electrooptical properties of heterojunction solar cells
[DE84-013285] N84-32925

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Analysis, testing, and evaluation of faulted and unfaulted Wye, Delta, and open Delta connected electromechanical actuators
[NASA-CR-171808] N84-32707

VIRGINIA UNIV., CHARLOTTESVILLE.
Climate prediction. Part 1: Cyclone frequency
[AD-A143578] N84-32973
Research in computer science
[NASA-CR-173857] N84-33056

VOUGHT CORP., DALLAS, TEX.
Low temperature evaluation of advanced technology hydraulic system (8,000 psi)
[AD-A143389] N84-32396

W

WASHINGTON UNIV., SEATTLE.
Multivariate curve resolution in liquid chromatography
[DE84-013797] N84-32466
Analysis of dynamic mixed-mode crack tip stress patterns
[AD-A143329] N84-32880
The petrology, structure and geochemistry of an Archean terrane in the North Snowy Block, Beartooth Mountains, Montana N84-32940
Geology, petrology and geochronology of the metamorphic rocks of Meatiq Dome, Central Eastern Desert, Egypt N84-32942
Lower tertiary biostratigraphy and paleoecology of the Quilcene-Discovery Bay area, northeast Olympic Peninsula, Washington N84-32943
Wave propagation in dense geophysical media
[AD-A143213] N84-32955
X-ray spectroscopy of solids under pressure
[DE84-013790] N84-33237
Nuclear magnetic resonance studies of ion motion in solid electrolytes
[DE84-013846] N84-33238

WAYNE STATE UNIV., DETROIT, MICH.
Free charged particle behavior in intense laser fields
[DE84-013700] N84-33160

WEAPONS SYSTEMS RESEARCH LAB., ADELAIDE (AUSTRALIA).
Static thrust augmentation of rocket motors by air entrainment
[AD-A143179] N84-32430
Investigation into the internal aerodynamic design and associated errors in a fast descent ducted sonde for the measurement of atmospheric pressure and temperature (AMPARS phase 2)
[AD-A143189] N84-32969

WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Investigation of Doubly-Fed Machine in Variable Speed Applications
[DE84-012943] N84-32928

WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Wide spectrum antireflective coating for laser fusion systems
[DE84-013211] N84-32814

WHEATON COLL., NORTON, MASS.
The ionization structure of planetary nebulae V NGC 3242
[NASA-CR-173914] N84-33322

WISCONSIN UNIV., MADISON.
Properties of UV-cured polyurethane acrylates: Effect of polyol type and molecular weight
[AD-A143176] N84-32537
Properties of UV-curable polyurethane acrylates: Effect of reactive diluent
[AD-A143241] N84-32540
Petrography and ultrasonic wave velocity in the Admire Formation (Permian), Kansas N84-32945
The climatic impact of volcanic activity N84-32963
Dynamical simulation of cloudy boundary layer flow during cold air outbreaks N84-32964
Local electronic properties of semiconductor surfaces and interfaces
[DE84-013608] N84-33239
Ultraviolet interstellar absorption toward stars in the small Magellanic cloud N84-33313

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
MAGSAT correlations with geoid anomalies
[E84-10190] N84-32894

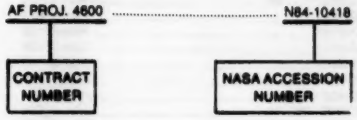
Y

YALE UNIV., NEW HAVEN, CONN.
Systematic jointing in the cardium sandstone along the Bow River, Alberta, Canada N84-32937
Editing by example N84-33070

Z

ZYCOR, INC., AUSTIN, TEX.
Manual and automated line generalization and feature displacement
[AD-A143250] N84-32900

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

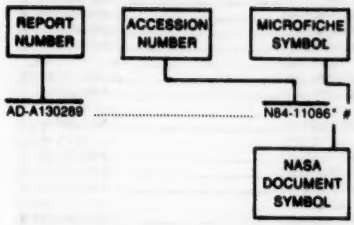
AF PROJ. 667-0 ..... N84-32971
AF PROJ. 775-7 ..... N84-33007
AF PROJ. 2305 ..... N84-32656
AF PROJ. 2306 ..... N84-33218
AF PROJ. 3923 ..... N84-32808
AF PROJ. 4600 ..... N84-32652
AF PROJ. 4643 ..... N84-32959
AF PROJ. 6670 ..... N84-32655
AF PROJ. 6687 ..... N84-32958
AF PROJ. 7600 ..... N84-32960
AF-AFOSR-82-K-0007 ..... N84-33132
AF-AFOSR-0006-82 ..... N84-32372
AF-AFOSR-0010-80 ..... N84-33227
AF-AFOSR-0101-83 ..... N84-32758
AF-AFOSR-0113-82 ..... N84-33102
AF-AFOSR-0142-83 ..... N84-33219
AF-AFOSR-0150-83 ..... N84-33119
AF-AFOSR-0176-80 ..... N84-32758
N84-32759
AF-AFOSR-0196-81 ..... N84-33117
AF-AFOSR-0232-82 ..... N84-33080
AF-AFOSR-0250-83 ..... N84-33131
AF-AFOSR-0267-82 ..... N84-33223
AF-AFOSR-0281-82 ..... N84-33228
AF-AFOSR-3426-77 ..... N84-33228
AF-AFOSR-3582-78 ..... N84-33061
AF-AFOSR-3708-78 ..... N84-33225
ARPA ORDER 2897 ..... N84-32961
ARPA ORDER 3923 ..... N84-32808
CHI PROJ. 8113-R N84-33255
N84-33256
DA PROJ. IT1-61102-BH-57 ..... N84-32541
DA PROJ. 1L1-62618-AH-80 ..... N84-32359
N84-32360
N84-32361
DA PROJ. 1L2-63102-D-071 ..... N84-32440
DA PROJ. 1T1-61102-BH-57 ..... N84-32554
N84-32879
DA PROJ. 3M1-61102-BS-10 ..... N84-33005
DAAB07-83-C-K514 ..... N84-33082
N84-33083
N84-33084
DAAG29-79-C-0155 ..... N84-33077
DAAG29-79-G-0017 ..... N84-32773
DAAG29-80-C-0132 ..... N84-32708
DAAG29-80-K-0022 ..... N84-32651
DAAG29-80-K-0067 ..... N84-32709
DAAG29-80-K-0099 ..... N84-32453
DAAG29-81-K-0047 ..... N84-32509
DAAG29-81-K-0055 ..... N84-33214
DAAG29-81-K-0065 ..... N84-32955
DAAG29-81-K-0087 ..... N84-33216
DAAG29-82-G-0005 ..... N84-32754
DAAG29-82-K-0156 ..... N84-33128
DAAG29-82-K-0168 ..... N84-33132
N84-33139
DAAG29-82-K-0178 ..... N84-33125
N84-33126
N84-33127
DAAG29-83-K-0003 ..... N84-33341
DAAG29-83-K-0004 ..... N84-32773
DAAG29-83-K-0029 ..... N84-33117
DAAG29-83-K-0084 ..... N84-32758
DAAG29-84-K-0007 ..... N84-33132
DAAG46-82-C-0060 ..... N84-32440
DAAK11-81-C-0064 ..... N84-32359
N84-32360
N84-32361
DAAK70-82-C-0001 ..... N84-32833
DAAK70-82-C-0104 ..... N84-32850
DAAK70-82-C-0149 ..... N84-32900
DAJA37-80-C-0477 ..... N84-32455
DAJA37-80-C-0845 ..... N84-32757
DAJA37-81-C-0053 ..... N84-32879
DAJA37-81-C-0196 ..... N84-32542
DAJA37-81-C-0215 ..... N84-32554
DAJA37-82-C-0234 ..... N84-32541
DAMD17-82-C-2136 ..... N84-33005
DE-AC01-80RA-50420 ..... N84-33103
DE-AC01-82CE-782221 ..... N84-33120
DE-AC02-76CH-00016 ..... N84-32456
N84-32457
N84-32558
N84-32764
N84-32884
N84-33111
N84-33121
N84-33154
N84-33162
N84-33236
N84-33246
DE-AC02-76CH-03000 ..... N84-32662
N84-33334
DE-AC02-76ER-02313 ..... N84-32517
DE-AC02-76ER-02383 ..... N34-33087
DE-AC02-76ER-02978 ..... N84-33170
DE-AC02-76ER-04027 ..... N84-32441
DE-AC02-77ER-04435 ..... N84-33239
DE-AC02-77ER-04471 ..... N84-33200
DE-AC02-77EV-04320 ..... N84-33203
DE-AC02-79ER-10421 ..... N84-32546
DE-AC02-79ER-10444 ..... N84-33248
DE-AC02-80ER-10669 ..... N84-33160
DE-AC02-80ER-10753 ..... N84-33328
DE-AC02-81ER-10907 ..... N84-32519
DE-AC02-81ER-10913 ..... N84-32458
DE-AC02-81RA-50292 ..... N84-32928
DE-AC02-82ER-12064 ..... N84-33241
DE-AC02-82ER-12085 ..... N84-32994
DE-AC02-83CH-10093 ..... N84-32926
N84-32929
DE-AC02-83ER-45030 ..... N84-32839
DE-AC02-83ER-45043 ..... N84-33242
DE-AC02-84ER-13163 ..... N84-32841
DE-AC03-76SF-00098 ..... N84-32459
N84-32464
N84-32520
N84-32521
N84-32726
N84-32731
N84-32737
N84-32740
N84-32767
N84-32930
N84-32995
N84-33159
N84-33192
N84-33235
N84-33247
N84-33327
DE-AC03-76SF-00515 ..... N84-32727
N84-33140
N84-33165
DE-AC03-82ER-13000 ..... N84-33234
DE-AC03-83SF-11725 ..... N84-33168
DE-AC03-84ER-52104 ..... N84-33202
DE-AC04-76DP-00053 ..... N84-32686
DE-AC04-76DP-00789 ..... N84-32363
N84-32460
N84-32461
N84-32547
N84-32572
N84-32732
N84-32734
N84-32735
N84-32736
N84-32770
N84-32798
N84-32844
N84-32883
N84-32885
N84-32927
N84-32931
N84-33085
N84-33123
N84-33134
N84-33163
N84-33164
DE-AC04-76DP-03533 ..... N84-32420
DE-AC05-76OR-03054 ..... N84-32556
DE-AC05-81ER-10848 ..... N84-33198
DE-AC05-84OR-21400 ..... N84-32442
N84-32518
N84-32522
N84-32661
N84-32724
N84-32763
N84-32765
N84-32819
N84-33089
N84-33193
N84-33195
N84-33199
N84-33204
DE-AC05-84OS-21400 ..... N84-32637
DE-AC06-76FF-02170 ..... N84-32465
N84-32513
DE-AC06-76RL-01830 ..... N84-32772
N84-32791
N84-32914
N84-32976
N84-33090
N84-33166
DE-AC08-81ER-40048 ..... N84-33335
DE-AC07-76GJ-01664 ..... N84-32462
DE-AC07-76ID-01570 ..... N84-32523
N84-33300
DE-AC09-76SR-00001 ..... N84-32636
DE-AC21-80ET-14705 ..... N84-32762
DE-AC21-81FE-15078 ..... N84-32733
DE-AC22-82FE-60148 ..... N84-32468
DE-AI01-76ET-20356 ..... N84-32683
N84-32920
N84-32921
N84-32922
N84-33213
N84-33299
DE-AI01-77CS-51040 ..... N84-33307
DE-AI01-77ET-28383 ..... N84-32902
DE-AI01-80C-50194 ..... N84-33309
DE-AI01-80CS-50194 ..... N84-33304
DE-AI01-80CS-50294 ..... N84-33306
DE-AI01-81CS-90103 ..... N84-33308
DE-AM03-76SF-00034 ..... N84-33202
DE-AM04-80AL-13137 ..... N84-32915
N84-32916
N84-32917
N84-32918
N84-32919
DE-AS05-76ER-05223 ..... N84-33161
DE-AS05-78ER-06035 ..... N84-32516
DE-AS05-81ER-40039 ..... N84-33167
DE-AT03-76ER-72018 ..... N84-33092
DE-AT03-80ET-27252 ..... N84-32571
N84-32573
N84-32574
DE-AT03-84ER-53158 ..... N84-33197
DE-AT03-84SF-11983 ..... N84-32842
DE-AT06-83ER-45038 ..... N84-33237
DE-AT06-83ER-60108 ..... N84-32466
DE-FC21-83FE-60181 ..... N84-32432
DE-FG02-79ER-0531 ..... N84-32925
DE-FG02-79ER-10535 ..... N84-33240
DE-FG46-80R6-12054 ..... N84-32761
DEN3-32 ..... N84-33307
DEN3-300 ..... N84-33304
DEN3-323 ..... N84-33309

DE84-011790 ..... N84-32974
DI-14-34-0001-2120 ..... N84-32904
DI-14-34-0001-2122 ..... N84-32967
DI-14-34-0001-7525 ..... N84-32471
DNA PROJ. I25-BMXI N84-33190
DNA PROJ. S99-QMXB N84-33191
DO-A01-78-3108 ..... N84-32412
N84-32413
DTFA03-81-00065 ..... N84-32366
DTRS5681-C-00025 ..... N84-32577
EPA-R-806216 ..... N84-32469
N84-32470
EPA-68-02-3469 ..... N84-32796
EY-76-S-02-2313 ..... N84-32517
F12-152 ..... N84-32792
F60-534 ..... N84-32543
F65-571 ..... N84-32553
F04701-83-C-0084 ..... N84-32710
N84-32954
F08606-80-C-0014 ..... N84-32961
F19628-80-C-0133 ..... N84-32957
F19628-81-C-0004 ..... N84-32653
F19628-81-K-0022 ..... N84-33156
F19628-82-C-0087 ..... N84-32956
F19628-83-C-0037 ..... N84-32419
F33615-82-C-0500 ..... N84-33006
F33615-82-C-5102 ..... N84-32510
N84-32511
F41689-82-C-0068 ..... N84-33060
F49620-81-C-0015 ..... N84-33133
F49620-81-K-0012 ..... N84-33221
F49620-82-C-0030 ..... N84-33185
F49620-82-C-0040 ..... N84-33222
F49620-82-K-0015 ..... N84-32809
F49620-83-C-0062 ..... N84-33079
N84-33096
N84-33118
F49620-83-C-0149 ..... N84-32808
F49620-83-K-0018 ..... N84-33061
F49620-83-K-0020 ..... N84-33220
GA PROJ. 3411 ..... N84-33197
JPL PROJ. 5105-136 ..... N84-32918
JPL PROJ. 5220-23 ..... N84-33299
JPL PROJ. 5260-32 ..... N84-32922
M00-97-PN N84-32793
NAGW-336 ..... N84-33323
NAGW-363 ..... N84-32696
NAG1-58 ..... N84-33145
N84-33146
NAG1-184 ..... N84-32377
NAG1-242 ..... N84-33058
NAG1-243 ..... N84-33071
NAG1-451 ..... N84-33020
NAG1-468 ..... N84-32423
NAG3-27 ..... N84-32552
NAG3-190 ..... N84-32390
NAG3-305 ..... N84-32682
NAG3-348 ..... N84-32503
NAG3-394 ..... N84-33306
NAG3-475 ..... N84-32645
NAG5-267 ..... N84-33310
NAG5-294 ..... N84-33315
NAG5-321 ..... N84-32694
NAG5-346 ..... N84-33316
NAG5-394 ..... N84-32950
NASW-3165 ..... N84-32990
NAS1-14583 ..... N84-32367
NAS1-15326 ..... N84-32395
NAS1-15829 ..... N84-33181
NAS1-16000 ..... N84-32397
NAS1-16521 ..... N84-33147
NAS1-16839 ..... N84-32410
NAS1-16870 ..... N84-32784
NAS1-16909 ..... N84-32677
NAS1-17070 ..... N84-32349
N84-33024
N84-33053
N84-33059
N84-33106
N84-33112
N84-33113
NAS1-17130 ..... N84-32349
N84-33024
N84-33059
N84-33111
NAS1-17261 ..... N84-33113
NAS2-11125 ..... N84-32406
NAS3-20072 ..... N84-32504
NAS3-20646 ..... N84-32389
NAS3-22514 ..... N84-33148
N84-33149
N84-33150
NAS3-23054 ..... N84-32828
NAS3-23352 ..... N84-32428
N84-32429
NAS3-23529 ..... N84-32790
NAS3-23696 ..... N84-32355
NAS5-22965 ..... N84-32948
NAS5-26200 ..... N84-32802
NAS5-26350 ..... N84-32750
NAS5-26686 ..... N84-32795
NAS5-26772 ..... N84-32646
N84-32647
N84-32648
N84-32649
NAS5-26859 ..... N84-32893
NAS5-27269 ..... N84-33178
NAS5-27888 ..... N84-32404
N84-32405
NAS7-100 ..... N84-32530
N84-32620
N84-32910
N84-32911
N84-32912
N84-33179
N84-33211
NAS7-918 ..... N84-32448
N84-32915
N84-32917
N84-32918
N84-32920
N84-32922
N84-33213
N84-33265
N84-33299
NAS8-33513 ..... N84-32749
NAS8-34769 ..... N84-32780
N84-32781
NAS8-34906 ..... N84-33097
NAS8-34947 ..... N84-32965
NAS8-35184 ..... N84-33022
NAS8-35507 ..... N84-32862
NAS9-15800 ..... N84-32414
N84-32416
NAS9-15840 ..... N84-32650
NAS9-16281 ..... N84-32707
NAS9-16283 ..... N84-32415
NAS9-16657 ..... N84-32535
NAS9-16723 ..... N84-33023
NA83AA-D-0016 ..... N84-32979
NCC2-89 ..... N84-32399
NCC2-148 ..... N84-32502
NCC2-234 ..... N84-32892
NGR-33-016-201 ..... N84-32356
NGR-39-007-011 ..... N84-32863
NR PROJ. 627-793 ..... N84-32450
N84-32451
N84-32538
N84-33215
NSF CEE-80-23003 ..... N84-32905
NSF DPP-81-7265 ..... N84-32896
NSF MCS-81-05896 ..... N84-33087
NSF MCS-81-16678 ..... N84-33077
NSF MCS-82-05355 ..... N84-33117
NSF MCS-83-02391 ..... N84-33077
NSF MCS-83-06854 ..... N84-33077
NSF OCE-83-11753/R N84-32966
NSF PRA-81-18601 ..... N84-33255
N84-33256
NSF PRA-84-00609 ..... N84-33286
NSG-1577 ..... N84-33105
NSG-1630 ..... N84-32352
NSG-3262 ..... N84-32751
NSG-3281 ..... N84-32678
NSG-5009 ..... N84-32534
NSG-5175 ..... N84-32951
NSG-5376 ..... N84-33322
NSG-7188 ..... N84-33319
NSG3-235 ..... N84-33210
N00014-75-C-0177 ..... N84-32882
N00014-75-C-0661 ..... N84-33064
N00014-76-C-0016 ..... N84-32406
N00014-76-C-0060 ..... N84-32880
N00014-76-C-0475 ..... N84-33115
N84-33130
N00014-79-C-0752 ..... N84-33116
N00014-80-C-0031 ..... N84-32755
N84-32767
N00014-80-C-0472 ..... N84-33226
N00014-80-C-0622 ..... N84-32713
N00014-81-C-0481 ..... N84-32756
N00014-81-K-0033 ..... N84-32973
N00014-81-K-0360 ..... N84-33065
N00014-82-C-0001 ..... N84-32712
N00014-82-C-0583 ..... N84-32454
N84-33184
N00014-82-C-0645 ..... N84-32830
N00014-82-C-2114 ..... N84-32711
N00014-82-C-2147 ..... N84-32658
N00014-82-C-2478 ..... N84-33182
N00014-82-G-0011 ..... N84-32992
N00014-82-K-0154 ..... N84-33077
N00014-82-K-0209 ..... N84-32807
N00014-83-C-0025 ..... N84-33293
N00014-83-C-0469 ..... N84-32539
N00014-83-C-0475 ..... N84-33157
N00014-83-K-0397 ..... N84-33116
N00014-83-K-0423 ..... N84-32537
N84-32540
N00014-83-K-0560 ..... N84-33078
N00014-83-K-0612 ..... N84-33224
N00014-84-K-0021 ..... N84-32452
N00173-79-C-0010 ..... N84-32714
N00600-82-D-8362 ..... N84-32345
N62269-82-C-0362 ..... N84-32396
RR0-1102 ..... N84-32851
RR0-2105 ..... N84-33129
RR0-3302 ..... N84-33191
RR0-3406 ..... N84-33183
RR0-4204 ..... N84-33116
SRO-100 ..... N84-33065
W-31-109-ENG-38 ..... N84-32545
N84-32549
N84-32559
N84-32570
N84-32720
N84-32721
N84-32722
N84-32729
N84-32730
N84-32739
N84-32741
N84-32766
N84-32771
N84-32840
N84-32843
N84-32846
N84-32901
N84-32962
N84-33153
N84-33158
W-7405-ENG-26 ..... N84-32518
N84-32837
N84-33135
W-7405-ENG-36 ..... N84-32514
N84-32515
N84-32557
N84-32723
N84-32725
N84-32738
N84-32769
N84-32817
N84-32818
N84-32993
N84-33066
N84-33086
N84-33088
N84-33122
N84-33136
N84-33169
N84-33196
N84-33230
N84-33232
N84-33233
N84-33243
N84-33244
N84-33245
N84-33311
N84-33321
W-7405-ENG-48 ..... N84-32463
N84-32467
N84-32548
N84-32663
N84-32664
N84-32723
N84-32728
N84-32768
N84-32801
N84-32814
N84-32815
N84-32816
N84-32844
N84-32845
N84-32975
N84-33091
N84-33099
N84-33201
W-7405-ENG-82 ..... N84-32852
N84-33194
N84-33231
Y09-9501 ..... N84-32543
ZR0-0001 ..... N84-32831
Z08-2901 ..... N84-32923
005-10-01 ..... N84-33285
188-41-57-02-00 ..... N84-32448
423-30-01 ..... N84-32752
505-07-10 ..... N84-32394
505-31-01 ..... N84-32350

N84-33106
505-31-01-01-00 ..... N84-32753
505-31-08 ..... N84-32351
505-31-21 ..... N84-32384
505-31-42 ..... N84-32446
N84-32552
505-31-51 ..... N84-32379
505-31-53 ..... N84-32397
505-31-83 ..... N84-32349
N84-33024
N84-33107
N84-33113
505-31-83-01 ..... N84-33059
N84-33108
N84-33111
N84-33112
505-32-21 ..... N84-32356
505-33-1A N84-32504
505-33-21 ..... N84-32438
505-33-33 ..... N84-32435
505-33-33-05 ..... N84-32436
N84-32439
505-33-43 ..... N84-32353
505-33-43-07 ..... N84-32348
505-33-90 ..... N84-32437
505-34-11 ..... N84-32393
505-40-1A N84-32357
505-40-32 ..... N84-32344
505-42-11 ..... N84-32360
505-43-90 ..... N84-32354
505-45-11 ..... N84-32431
505-45-13-01 ..... N84-32365
505-45-14 ..... N84-32378
505-45-23-01 ..... N84-32827
505-53-1A N84-32849
506-51-33-01 ..... N84-32410
506-53-1B N84-32506
N84-32531
N84-32536
N84-32825
506-53-11 ..... N84-32502
506-53-23 ..... N84-32877
506-53-33 ..... N84-32506
N84-32507
506-53-33-01 ..... N84-32505
506-54-26 ..... N84-32679
506-55-42 ..... N84-32426
N84-32427
506-57-13-03 ..... N84-32423
506-58-13 ..... N84-32784
506-58-22 ..... N84-32783
N84-32789
510-55-12 ..... N84-32355
532-03-11 ..... N84-32361
535-03-12 ..... N84-33147
535-05-12 ..... N84-32366
650-80-23 ..... N84-32644
776-52-62 ..... N84-32922
N84-33299
776-81-62 ..... N84-32917
N84-32918

REPORT / ACCESSION NUMBER INDEX

Typical Report / Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-9222 ..... N84-32393* #
A-9303 ..... N84-32380* #
A-9377 ..... N84-32431* #
A-9533 ..... N84-32394* #
A-9689 ..... N84-33365* #
A-9752 ..... N84-33106* #
A-9768 ..... N84-32752* #
A-9778 ..... N84-32350* #
A-9812 ..... N84-32358* #
A-9844 ..... N84-32438* #
A-9845 ..... N84-32379* #
A-9848 ..... N84-32753* #

ACSC-84-2225 ..... N84-33252 #
ACSC-84-2605 ..... N84-33266 #
ACSC-84-2765 ..... N84-33063 #
ACSC-84-2780 ..... N84-33253 #

AD-A142705 ..... N84-33005 #
AD-A143176 ..... N84-32537 #
AD-A143177 ..... N84-33125 #
AD-A143179 ..... N84-32430 #
AD-A143180 ..... N84-33214 #
AD-A143181 ..... N84-32954 #
AD-A143182 ..... N84-32754 #
AD-A143184 ..... N84-32708 #
AD-A143186 ..... N84-32509 #
AD-A143189 ..... N84-32969 #
AD-A143195 ..... N84-33126 #
AD-A143196 ..... N84-32651 #
AD-A143198 ..... N84-32449 #
AD-A143199 ..... N84-32536 #
AD-A143200 ..... N84-32450 #
AD-A143201 ..... N84-33215 #
AD-A143202 ..... N84-32451 #
AD-A143203 ..... N84-32878 #
AD-A143204 ..... N84-32709 #
AD-A143207 ..... N84-32539 #
AD-A143208 ..... N84-33216 #
AD-A143209 ..... N84-33127 #
AD-A143213 ..... N84-32955 #
AD-A143215 ..... N84-33128 #
AD-A143216 ..... N84-32806 #
AD-A143219 ..... N84-32345 #
AD-A143222 ..... N84-33139 #
AD-A143225 ..... N84-33155 #
AD-A143226 ..... N84-33060 #
AD-A143228 ..... N84-32452 #
AD-A143229 ..... N84-33151 #
AD-A143230 ..... N84-32710 #
AD-A143231 ..... N84-32956 #
AD-A143233 ..... N84-32711 #
AD-A143238 ..... N84-33287 #
AD-A143239 ..... N84-32652 #
AD-A143241 ..... N84-32540 #
AD-A143246 ..... N84-33006 #
AD-A143248 ..... N84-32630 #
AD-A143249 ..... N84-32541 #
AD-A143250 ..... N84-32900 #
AD-A143252 ..... N84-32359 #
AD-A143253 ..... N84-32360 #
AD-A143254 ..... N84-32361 #
AD-A143255 ..... N84-33217 #
AD-A143258 ..... N84-32382 #
AD-A143262 ..... N84-32650 #
AD-A143264 ..... N84-33156 #
AD-A143266 ..... N84-32653 #
AD-A143269 ..... N84-32453 #
AD-A143273 ..... N84-32970 #
AD-A143274 ..... N84-32712 #
AD-A143275 ..... N84-33218 #
AD-A143277 ..... N84-32957 #
AD-A143279 ..... N84-32755 #
AD-A143283 ..... N84-32879 #
AD-A143287 ..... N84-33129 #
AD-A143289 ..... N84-33157 #
AD-A143295 ..... N84-32807 #
AD-A143297 ..... N84-33101 #
AD-A143298 ..... N84-33190 #
AD-A143299 ..... N84-32851 #
AD-A143302 ..... N84-32654 #
AD-A143305 ..... N84-32792 #
AD-A143315 ..... N84-33252 #
AD-A143316 ..... N84-33253 #
AD-A143317 ..... N84-32958 #
AD-A143318 ..... N84-32655 #
AD-A143319 ..... N84-32959 #
AD-A143320 ..... N84-32417 #
AD-A143321 ..... N84-32656 #
AD-A143324 ..... N84-33061 #
AD-A143327 ..... N84-32510 #
AD-A143328 ..... N84-32511 #
AD-A143329 ..... N84-32880 #
AD-A143330 ..... N84-32406* #
AD-A143331 ..... N84-33182 #
AD-A143347 ..... N84-32419 #
AD-A143349 ..... N84-32681 #
AD-A143350 ..... N84-32657 #
AD-A143360 ..... N84-32372 #
AD-A143361 ..... N84-33219 #
AD-A143364 ..... N84-33130 #
AD-A143368 ..... N84-32882 #
AD-A143383 ..... N84-32991 #
AD-A143384 ..... N84-33183 #
AD-A143386 ..... N84-32542 #
AD-A143387 ..... N84-33131 #
AD-A143389 ..... N84-32396 #
AD-A143390 ..... N84-32553 #
AD-A143391 ..... N84-33191 #
AD-A143392 ..... N84-32960 #
AD-A143393 ..... N84-32971 #
AD-A143398 ..... N84-33288 #
AD-A143401 ..... N84-32756 #
AD-A143402 ..... N84-32923 #
AD-A143419 ..... N84-32382 #
AD-A143423 ..... N84-33220 #
AD-A143424 ..... N84-33077 #
AD-A143425 ..... N84-33062 #
AD-A143426 ..... N84-33221 #
AD-A143428 ..... N84-33289 #
AD-A143430 ..... N84-32713 #
AD-A143434 ..... N84-33132 #
AD-A143438 ..... N84-33290 #
AD-A143439 ..... N84-33114 #
AD-A143446 ..... N84-33063 #
AD-A143449 ..... N84-32808 #
AD-A143450 ..... N84-33115 #
AD-A143456 ..... N84-33222 #
AD-A143458 ..... N84-32543 #
AD-A143459 ..... N84-33064 #
AD-A143465 ..... N84-33223 #
AD-A143466 ..... N84-32454 #
AD-A143467 ..... N84-32757 #
AD-A143468 ..... N84-33116 #
AD-A143469 ..... N84-33224 #
AD-A143470 ..... N84-33078 #
AD-A143471 ..... N84-33184 #
AD-A143473 ..... N84-32631 #
AD-A143474 ..... N84-33065 #
AD-A143485 ..... N84-33254 #
AD-A143487 ..... N84-33117 #
AD-A143499 ..... N84-32632 #
AD-A143500 ..... N84-33291 #
AD-A143501 ..... N84-33292 #
AD-A143503 ..... N84-33293 #
AD-A143506 ..... N84-32758 #
AD-A143507 ..... N84-32992 #
AD-A143510 ..... N84-32759 #
AD-A143525 ..... N84-32455 #
AD-A143526 ..... N84-32760 #
AD-A143527 ..... N84-33079 #
AD-A143528 ..... N84-33118 #
AD-A143529 ..... N84-33098 #
AD-A143530 ..... N84-32833 #
AD-A143531 ..... N84-33250 #
AD-A143532 ..... N84-33080 #
AD-A143533 ..... N84-33081 #
AD-A143536 ..... N84-33152 #
AD-A143537 ..... N84-33119 #
AD-A143538 ..... N84-32809 #
AD-A143542 ..... N84-32440 #
AD-A143547 ..... N84-33102 #
AD-A143551 ..... N84-33225 #
AD-A143552 ..... N84-33226 #
AD-A143556 ..... N84-33227 #
AD-A143559 ..... N84-33228 #
AD-A143563 ..... N84-32984 #
AD-A143564 ..... N84-32972 #
AD-A143565 ..... N84-33185 #
AD-A143569 ..... N84-32400 #
AD-A143570 ..... N84-33007 #
AD-A143571 ..... N84-32714 #
AD-A143572 ..... N84-32961 #
AD-A143573 ..... N84-32554 #
AD-A143575 ..... N84-32658 #
AD-A143576 ..... N84-32973 #
AD-A143581 ..... N84-33082 #
AD-A143584 ..... N84-33083 #
AD-A143585 ..... N84-33084 #
AD-A143587 ..... N84-33133 #
AD-A143588 ..... N84-32985 #
AD-A143589 ..... N84-32793 #

AD-D011051 ..... N84-32617
AD-D011053 ..... N84-32774
AD-D011054 ..... N84-32418
AD-D011055 ..... N84-32618
AD-D011056 ..... N84-32775
AD-D011057 ..... N84-32671
AD-D011058 ..... N84-32384
AD-D011059 ..... N84-33171
AD-D011060 ..... N84-32563
AD-D011082 ..... N84-32834 #
AD-D011083 ..... N84-32835 #
AD-D011085 ..... N84-32794 #
AD-D011086 ..... N84-32391 #
AD-D011087 ..... N84-32836 #
AD-D011088 ..... N84-32715 #
AD-D011090 ..... N84-33186 #
AD-D011091 ..... N84-32716 #
AD-D011092 ..... N84-32659 #
AD-D011093 ..... N84-33187 #
AD-D011094 ..... N84-32512 #
AD-D011095 ..... N84-32717 #
AD-D011096 ..... N84-32544 #
AD-D011097 ..... N84-33229 #
AD-D011098 ..... N84-32810 #
AD-D011099 ..... N84-32373 #
AD-D011101 ..... N84-32392 #
AD-D011102 ..... N84-32811 #
AD-D011103 ..... N84-32718 #
AD-D011104 ..... N84-32812 #
AD-D011105 ..... N84-32795 #
AD-D011106 ..... N84-33172
AD-D011107 ..... N84-32799
AD-D011108 ..... N84-32672
AD-D011109 ..... N84-32673
AD-D011111 ..... N84-32421
AD-D011112 ..... N84-32551
AD-D011113 ..... N84-32908
AD-D011114 ..... N84-33173
AD-D011115 ..... N84-33174
AD-D011116 ..... N84-32674
AD-D011117 ..... N84-33188 #
AD-D011118 ..... N84-32719 #
AD-D011119 ..... N84-32660 #
AD-D011120 ..... N84-32813 #

AD-D011121 ..... N84-32445
AD-D011122 ..... N84-32529
AD-D011123 ..... N84-33208
AD-D011124 ..... N84-33175
AD-D011125 ..... N84-32900
AD-D011127 ..... N84-33176
AD-D011128 ..... N84-33055
AD-D011129 ..... N84-32386
AD-D011130 ..... N84-32776
AD-D011132 ..... N84-32555 #
AD-D011133 ..... N84-32924 #
AD-D011135 ..... N84-32675
AD-D011136 ..... N84-32676
AD-D011137 ..... N84-33209
AD-D011138 ..... N84-32777
AD-D011140 ..... N84-33177
AD-D011141 ..... N84-32778
AD-D011142 ..... N84-32434
AD-D011143 ..... N84-32619
AD-D011144 ..... N84-32376
AD-D011145 ..... N84-32779

AD-E400961 ..... N84-32553 #
AD-E400961 ..... N84-32960 #
AD-E400961 ..... N84-32971 #
AD-E400961 ..... N84-33191 #
AD-E750949 ..... N84-32540 #
AD-E750949 ..... N84-32652 #
AD-E750949 ..... N84-32711 #
AD-E750949 ..... N84-33257 #
AD-E800972 ..... N84-32783 #
AD-E800972 ..... N84-32965 #

AD-F300438 ..... N84-32359 #
AD-F300439 ..... N84-32360 #
AD-F300440 ..... N84-32361 #

AEM-H2-2 ..... N84-32682 #

AFAMRL-TR-84-023 ..... N84-33006 #

AFESC/ESL-TR-84-14 ..... N84-33060 #

AFGL-ERP-863 ..... N84-32971 #
AFGL-ERP-865 ..... N84-32960 #
AFGL-ERP-869 ..... N84-32959 #
AFGL-ERP-870 ..... N84-32655 #

AFGL-IP-322 ..... N84-32958 #
AFGL-IP-323 ..... N84-32417 #

AFGL-TR-83-0316 ..... N84-32957 #
AFGL-TR-83-0328 ..... N84-32971 #
AFGL-TR-84-0005 ..... N84-32960 #
AFGL-TR-84-0045 ..... N84-32959 #
AFGL-TR-84-0046 ..... N84-32958 #
AFGL-TR-84-0047 ..... N84-32655 #
AFGL-TR-84-0054 ..... N84-32417 #
AFGL-TR-84-0069 ..... N84-32653 #
AFGL-TR-84-0087 ..... N84-32956 #
AFGL-TR-84-0127 ..... N84-33156 #

AFIT-LSSR-66-83 ..... N84-33290 #

AFLRL-175 ..... N84-32633 #

AFOSR-83-1667TR ..... N84-33132 #
AFOSR-84-0548TR ..... N84-33221 #
AFOSR-84-0550TR ..... N84-33227 #
AFOSR-84-0555TR ..... N84-33061 #
AFOSR-84-0556TR ..... N84-32372 #
AFOSR-84-0558TR ..... N84-33098 #
AFOSR-84-0559TR ..... N84-33079 #
AFOSR-84-0560TR ..... N84-33118 #
AFOSR-84-0561TR ..... N84-33131 #
AFOSR-84-0563TR ..... N84-33081 #
AFOSR-84-0564TR ..... N84-32758 #
AFOSR-84-0567TR ..... N84-33119 #
AFOSR-84-0568TR ..... N84-33117 #
AFOSR-84-0569TR ..... N84-32759 #
AFOSR-84-0570TR ..... N84-33102 #
AFOSR-84-0571TR ..... N84-33220 #
AFOSR-84-0572TR ..... N84-32809 #
AFOSR-84-0573TR ..... N84-32808 #
AFOSR-84-0574TR ..... N84-33185 #
AFOSR-84-0575TR ..... N84-33080 #
AFOSR-84-0577TR ..... N84-33133 #
AFOSR-84-0582TR ..... N84-33226 #
AFOSR-84-0583TR ..... N84-33222 #
AFOSR-84-0584TR ..... N84-33223 #
AFOSR-84-0585TR ..... N84-33225 #
AFOSR-84-0586TR ..... N84-33219 #

AGARD-AR-168 ..... N84-32401 #
AGARD-AR-193 ..... N84-32402 #

AGARD-CP-341 ..... N84-33011 #

AGES-840416 ..... N84-33068 #

AIAA-84-1768 ..... N84-32505* #

AMMRC-TR-84-22 ..... N84-32440 #

ANL/ES-136-PT-1 ..... N84-32901 #
ANL/ES-137-PT-1 ..... N84-32962 #

AR-10 ..... N84-33283 #
AR-11 ..... N84-33282 #
AR-003-814 ..... N84-32803 #
AR-003-939 ..... N84-33072 #
AR-003-953 ..... N84-33058 #

ARBRL-CR-00527 ..... N84-32359 #
ARBRL-CR-00528 ..... N84-32360 #
ARBRL-CR-00529 ..... N84-32361 #

ARI-RN-84-108 ..... N84-33062 #

ARL-SYS-TM-72 ..... N84-33072 #
ARL-SYS-TM-73 ..... N84-33058 #

ARL/PSU/TM-83-202 ..... N84-32756 #

ARL/STRUC-TM-360 ..... N84-32878 #

ARO-16632.8-EL ..... N84-32651 #
ARO-16813.1-EL ..... N84-32708 #
ARO-17369.16-CH ..... N84-32453 #
ARO-17433.5-EL ..... N84-32709 #
ARO-17746.1-GS ..... N84-32955 #
ARO-17772.11-EL ..... N84-33214 #
ARO-17877.6-MS ..... N84-32509 #
ARO-18063.5-EL ..... N84-33216 #
ARO-19065.10-MA ..... N84-33128 #
ARO-19201.2-EG-H ..... N84-32754 #
ARO-19367.13-MA ..... N84-33132 #
ARO-19442.17-MA ..... N84-33126 #
ARO-19442.18-MA ..... N84-33125 #
ARO-19442.19-MA ..... N84-33127 #
ARO-20063.1-MA ..... N84-33132 #

ASR-1 ..... N84-33005 #

AVSCOM-TR-84-C-5 ..... N84-32388* #

B-206829 ..... N84-33294 #
B-213969 ..... N84-32371 #

BBC-RD-1984/7 ..... N84-32615
BBC-RD-1984/8 ..... N84-32614

BBN-5520 ..... N84-32440 #

BBSO-0229 ..... N84-33178* #

BLL-M-35633-(5828.4) N84-32482
BLL-M-35634-(5828.4) N84-32481
BLL-M-35640-(5828.4) N84-32480
BLL-M-35641-(5828.4) N84-32498
BLL-M-35642-(5828.4) N84-32497
BLL-M-35653-(5828.4) N84-32486
BLL-M-35656-(5828.4) N84-32473
BLL-M-35657-(5828.4) N84-32474
BLL-M-35666-(5828.4) N84-32500
BLL-M-35671-(5828.4) N84-32501
BLL-M-35672-(5828.4) N84-32496
BLL-M-35673-(5828.4) N84-32444
BLL-M-35674-(5828.4) N84-32747
BLL-M-35680-(5828.4) N84-32681
BLL-M-35681-(5828.4) N84-32822
BLL-M-35682-(5828.4) N84-32499
BLL-M-35684-(5828.4) N84-32495
BLL-M-35686-(5828.4) N84-32485
BLL-M-35687-(5828.4) N84-32479
BLL-M-35689-(5828.4) N84-33104
BLL-M-35690-(5828.4) N84-32860
BLL-M-35698-(5828.4) N84-32483

BLL-RISLEY-TRANS-4519-(9091.9) N84-32475
BLL-RISLEY-TRANS-4556-(9091.9) N84-32476
BLL-RISLEY-TRANS-4557-(9091.9) N84-32484
BLL-RISLEY-TRANS-4563-(9091.9) N84-32443
BLL-RISLEY-TRANS-4568-(9091.9) N84-32478
BLL-RISLEY-TRANS-4571-(9091.9) N84-32477
BLL-RISLEY-TRANS-4584-(9091.9) N84-32848
BLL-RISLEY-TRANS-4585-(9091.9) N84-32847

BLL-T6310/BG/WH770/84 ..... N84-32486
BLL-T6313/BG/WH773/84 ..... N84-32487

BM-IC-8660 ..... N84-32524 #

BMFT-FB-T-84-081 ..... N84-33093 #
BMFT-FB-T-84-092 ..... N84-33189 #

BNL-NUREG-34545 ..... N84-32864 #

BNL-TR-1028 ..... N84-33154 #
BNL-TR-1031 ..... N84-33121 #

BNL-34689 ..... N84-32456 #
BNL-34707 ..... N84-32764 #
BNL-34779 ..... N84-33236 #
BNL-34780 ..... N84-33246 #
BNL-34839 ..... N84-32457 #
BNL-34846 ..... N84-33162 #

BR92720 ..... N84-32604 #
BR92722 ..... N84-33004 #

C-30221-E1 ..... N84-32804 #

CAR-TR-53 ..... N84-33116 #
CAR-TR-57 ..... N84-33079 #
CAR-TR-63 ..... N84-33096 #

CHAM-H3605/15-VOL-1 ..... N84-32426* #
CHAM-H3605/16-VOL-2 ..... N84-32429* #

CONF-830165 ..... N84-32929 #
CONF-830759-4 ..... N84-32637 #
CONF-831063-14 ..... N84-32762 #
CONF-831203-163 ..... N84-32601 #
CONF-831219-1 ..... N84-32557 #
CONF-831284-1 ..... N84-32766 #
CONF-840101-3 ..... N84-33194 #
CONF-840139-6 ..... N84-32815 #
CONF-840150-6 ..... N84-33334 #
CONF-840290-1 ..... N84-32457 #
CONF-840385-3 ..... N84-33321* #
CONF-840391-2 ..... N84-32683 #
CONF-840403-2 ..... N84-32724 #
CONF-840405-13 ..... N84-33247 #
CONF-840520-5 ..... N84-33192 #
CONF-840520-8 ..... N84-33199 #
CONF-840520-14 ..... N84-33202 #
CONF-840529-28 ..... N84-33184 #
CONF-840530-4 ..... N84-33162 #
CONF-840561-13 ..... N84-32926 #
CONF-840576-5 ..... N84-33120 #
CONF-840604-10 ..... N84-32522 #
CONF-840616-16 ..... N84-33197 #
CONF-840616-17 ..... N84-33201 #
CONF-840620-4 ..... N84-32729 #
CONF-840647-18 ..... N84-32683 #
CONF-840647-20 ..... N84-32652 #
CONF-840653-4 ..... N84-32686 #
CONF-840677-3 ..... N84-32720 #
CONF-840753-1 ..... N84-32767 #
CONF-840801-1 ..... N84-32467 #
CONF-840801-2 ..... N84-32463 #
CONF-840801-4 ..... N84-32844 #
CONF-840801-7 ..... N84-32459 #
CONF-840801-14 ..... N84-32464 #
CONF-840804-1 ..... N84-32559 #
CONF-840804-6 ..... N84-32734 #
CONF-840804-13 ..... N84-32840 #
CONF-840804-20 ..... N84-33169 #
CONF-840804-22 ..... N84-32842 #
CONF-840804-23 ..... N84-32722 #
CONF-840804-24 ..... N84-32721 #
CONF-840805-4 ..... N84-32432 #
CONF-840805-16 ..... N84-32548 #
CONF-840816-1 ..... N84-32770 #
CONF-840816-4 ..... N84-32771 #
CONF-840816-12 ..... N84-32796 #
CONF-840816-13 ..... N84-32764 #
CONF-840820-1 ..... N84-32723 #
CONF-840830-1 ..... N84-33085 #
CONF-840833-3 ..... N84-32684 #
CONF-840833-4 ..... N84-32766 #
CONF-840833-5 ..... N84-32570 #
CONF-840842-3 ..... N84-33232 #
CONF-840842-4 ..... N84-33233 #
CONF-840842-5 ..... N84-33244 #
CONF-840842-8 ..... N84-32515 #
CONF-840842-9 ..... N84-33245 #
CONF-840842-10 ..... N84-33243 #
CONF-840842-11 ..... N84-32514 #
CONF-840842-12 ..... N84-33153 #
CONF-840842-17 ..... N84-33230 #
CONF-840845-1 ..... N84-32931 #
CONF-840849-1 ..... N84-33134 #
CONF-840849-2 ..... N84-33136 #
CONF-840849-3 ..... N84-33135 #
CONF-840850-1 ..... N84-32845 #
CONF-840853-1 ..... N84-32545 #
CONF-840853-2 ..... N84-32741 #

CONF-840853-4 ..... N84-32730 #
CONF-840853-5 ..... N84-32729 #
CONF-840867-2 ..... N84-32558 #
CONF-840968-1 ..... N84-32460 #
CONF-840869-1A ..... N84-33086 #
CONF-840916-2 ..... N84-32843 #
CONF-840981-3 ..... N84-32817 #
CONF-841058-2 ..... N84-32731 #
CONF-8205266-1 ..... N84-33166 #
CONF-8307121-1 ..... N84-33203 #
CONF-8307122-2 ..... N84-32995 #
CONF-8403119-2 ..... N84-32975 #
CONF-8403132-1 ..... N84-33236 #
CONF-8403132-2 ..... N84-33246 #
CONF-8404110-6 ..... N84-33231 #
CONF-8404143-4 ..... N84-33158 #
CONF-8405122-1 ..... N84-32456 #
CONF-8405153-2 ..... N84-32772 #
CONF-8405153-3 ..... N84-32976 #
CONF-8405172-1 ..... N84-33300 #
CONF-8405180-2 ..... N84-33311 #
CONF-8405190-1 ..... N84-32518 #
CONF-8405194-1 ..... N84-33090 #
CONF-8405199 ..... N84-32928 #
CONF-8406113-3 ..... N84-33122 #
CONF-8406137-1 ..... N84-32735 #
CONF-8406137-13 ..... N84-32818 #
CONF-8406139-1 ..... N84-33099 #
CONF-8406148-1 ..... N84-32993 #

COO-2313-14 ..... N84-32517 #
COO-2363-0104 ..... N84-33087 #

CS-TR-1380 ..... N84-33118 #
CS-TR-1388 ..... N84-33079 #
CS-TR-1401 ..... N84-33098 #

CSC/TM-84-6083 ..... N84-32405* #
CSC/TM-84/6059 ..... N84-32404* #

CSIR-TRANS-1730 ..... N84-32564 #
CSIR-TRANS-1735 ..... N84-32492
CSIR-TRANS-1736 ..... N84-32561
CSIR-TRANS-1738 ..... N84-32533
CSIR-TRANS-1739 ..... N84-32490
CSIR-TRANS-1740 ..... N84-32489
CSIR-TRANS-1741 ..... N84-32491
CSIR-TRANS-1742 ..... N84-32525
CSIR-TRANS-1743 ..... N84-32526
CSIR-TRANS-1744 ..... N84-32562
CSIR-TRANS-1745 ..... N84-33206
CSIR-TRANS-1746 ..... N84-33205
CSIR-TRANS-1747 ..... N84-32527
CSIR-TRANS-1748 ..... N84-32493
CSIR-TRANS-1749 ..... N84-32528
CSIR-TRANS-1750 ..... N84-32821
CSIR-TRANS-1751 ..... N84-32494
CSIR-TRANS-1752 ..... N84-33207

CTR-3-5-79-247-5F ..... N84-32687 #
CTR-3-5-81-306-1 ..... N84-32688 #

DE83-017313 ..... N84-32723 #
DE84-000089 ..... N84-32929 #
DE84-001722 ..... N84-33088 #
DE84-002612 ..... N84-32770 #
DE84-004508 ..... N84-32926 #
DE84-005739 ..... N84-32467 #
DE84-006134 ..... N84-32844 #
DE84-006300 ..... N84-32463 #
DE84-006385 ..... N84-32761 #
DE84-006405 ..... N84-32771 #
DE84-006420 ..... N84-32559 #
DE84-006771 ..... N84-32459 #
DE84-006964 ..... N84-33085 #
DE84-007193 ..... N84-32902 #
DE84-007611 ..... N84-33168 #
DE84-008513 ..... N84-32837 #
DE84-009586 ..... N84-32741 #
DE84-009587 ..... N84-32570 #
DE84-009629 ..... N84-32766 #
DE84-009635 ..... N84-32545 #
DE84-009984 ..... N84-33244 #
DE84-009985 ..... N84-33243 #
DE84-009990 ..... N84-33245 #
DE84-009991 ..... N84-32515 #
DE84-010068 ..... N84-32514 #
DE84-010072 ..... N84-33233 #
DE84-010076 ..... N84-33232 #
DE84-010161 ..... N84-32432 #
DE84-010284 ..... N84-32884 #
DE84-010519 ..... N84-33153 #
DE84-010600 ..... N84-33134 #
DE84-010630 ..... N84-32458 #
DE84-011059 ..... N84-32845 #
DE84-011186 ..... N84-32734 #
DE84-011191 ..... N84-33164 #
DE84-011616 ..... N84-33167 #
DE84-011658 ..... N84-32724 #
DE84-011741 ..... N84-33158 #
DE84-011783 ..... N84-32839 #
DE84-011790 ..... N84-32974 #
DE84-012096 ..... N84-32840 #
DE84-012110 ..... N84-32729 #
DE84-012112 ..... N84-32730 #
DE84-012234 ..... N84-32796 #
DE84-012240 ..... N84-32460 #
DE84-012257 ..... N84-32464 #
DE84-012259 ..... N84-33192 #
DE84-012275 ..... N84-32931 #
DE84-012346 ..... N84-33199 #
DE84-012351 ..... N84-32518 #
DE84-012421 ..... N84-32838 #
DE84-012435 ..... N84-33321* #
DE84-012438 ..... N84-33136 #
DE84-012582 ..... N84-33122 #
DE84-012607 ..... N84-32548 #
DE84-012623 ..... N84-32557 #
DE84-012626 ..... N84-33135 #
DE84-012634 ..... N84-33230 #
DE84-012639 ..... N84-33086 #
DE84-012649 ..... N84-33300 #
DE84-012656 ..... N84-33169 #
DE84-012676 ..... N84-32815 #
DE84-012792 ..... N84-32462 #
DE84-012861 ..... N84-33121 #
DE84-012866 ..... N84-33154 #
DE84-012899 ..... N84-32784 #
DE84-012903 ..... N84-32558 #
DE84-012908 ..... N84-32456 #
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DE84-012940 ..... N84-33198 #
DE84-012943 ..... N84-32926 #
DE84-012954 ..... N84-32663 #
DE84-012959 ..... N84-32735 #
DE84-012969 ..... N84-32468 #
DE84-012971 ..... N84-33161 #
DE84-012975 ..... N84-32556 #
DE84-012976 ..... N84-32516 #
DE84-013057 ..... N84-32883 #
DE84-013071 ..... N84-33091 #
DE84-013075 ..... N84-32801 #
DE84-013076 ..... N84-32975 #
DE84-013083 ..... N84-33334 #
DE84-013089 ..... N84-32728 #
DE84-013111 ..... N84-33103 #
DE84-013118 ..... N84-32664 #
DE84-013122 ..... N84-33246 #
DE84-013124 ..... N84-33236 #
DE84-013132 ..... N84-32763 #
DE84-013142 ..... N84-33162 #
DE84-013192 ..... N84-32736 #
DE84-013210 ..... N84-33099 #
DE84-013211 ..... N84-32814 #
DE84-013216 ..... N84-32461 #
DE84-013219 ..... N84-32768 #
DE84-013226 ..... N84-32457 #
DE84-013235 ..... N84-32731 #
DE84-013242 ..... N84-33235 #
DE84-013256 ..... N84-33090 #
DE84-013262 ..... N84-33166 #
DE84-013267 ..... N84-32976 #
DE84-013269 ..... N84-32772 #
DE84-013276 ..... N84-33248 #
DE84-013282 ..... N84-33140 #
DE84-013285 ..... N84-32925 #
DE84-013345 ..... N84-32842 #
DE84-013379 ..... N84-33197 #
DE84-013386 ..... N84-33203 #
DE84-013390 ..... N84-33247 #
DE84-013391 ..... N84-32767 #
DE84-013397 ..... N84-32995 #
DE84-013417 ..... N84-32843 #
DE84-013427 ..... N84-32720 #
DE84-013436 ..... N84-32722 #
DE84-013452 ..... N84-32721 #
DE84-013477 ..... N84-32441 #
DE84-013499 ..... N84-33200 #
DE84-013513 ..... N84-33165 #
DE84-013516 ..... N84-33234 #
DE84-013539 ..... N84-33123 #
DE84-013571 ..... N84-32363 #
DE84-013576 ..... N84-32765 #
DE84-013590 ..... N84-33308 #
DE84-013600 ..... N84-33193 #
DE84-013602 ..... N84-33195 #
DE84-013606 ..... N84-33239 #
DE84-013627 ..... N84-33204 #
DE84-013647 ..... N84-33170 #
DE84-013649 ..... N84-33087 #
DE84-013672 ..... N84-32901 #
DE84-013673 ..... N84-32962 #
DE84-013694 ..... N84-32574 #
DE84-013695 ..... N84-32573 #
DE84-013696 ..... N84-32571 #
DE84-013700 ..... N84-33160 #
DE84-013729 ..... N84-32852 #
DE84-013767 ..... N84-32661 #
DE84-013790 ..... N84-33237 #
DE84-013793 ..... N84-32727 #
DE84-013797 ..... N84-32466 #
DE84-013807 ..... N84-32547 #
DE84-013812 ..... N84-32994 #
DE84-013829 ..... N84-33335 #
DE84-013837 ..... N84-33201 #
DE84-013846 ..... N84-33238 #
DE84-013861 ..... N84-33196 #
DE84-013871 ..... N84-33120 #
DE84-013877 ..... N84-32930 #
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DE84-013894 ..... N84-32993 #
DE84-013914 ..... N84-33328 #
DE84-013916 ..... N84-32420 #
DE84-013919 ..... N84-32572 #
DE84-013920 ..... N84-32927 #
DE84-013941 ..... N84-32513 #
DE84-013942 ..... N84-32465 #
DE84-013948 ..... N84-32762 #
DE84-014026 ..... N84-32817 #
DE84-014032 ..... N84-33311 #
DE84-014064 ..... N84-32662 #
DE84-014097 ..... N84-32841 #
DE84-014125 ..... N84-33231 #
DE84-014126 ..... N84-33194 #
DE84-014129 ..... N84-33066 #
DE84-014136 ..... N84-33327 #
DE84-014137 ..... N84-32769 #
DE84-014141 ..... N84-32725 #
DE84-014147 ..... N84-32666 #
DE84-014230 ..... N84-32738 #
DE84-014231 ..... N84-32740 #
DE84-014242 ..... N84-33163 #
DE84-014288 ..... N84-32522 #
DE84-014320 ..... N84-32846 #
DE84-014327 ..... N84-33202 #
DE84-014330 ..... N84-32732 #
DE84-014417 ..... N84-33089 #
DE84-014453 ..... N84-32665 #
DE84-014500 ..... N84-32819 #
DE84-014506 ..... N84-32549 #
DE84-014508 ..... N84-32739 #
DE84-014510 ..... N84-32737 #
DE84-014604 ..... N84-32521 #
DE84-014605 ..... N84-32520 #
DE84-014656 ..... N84-32517 #
DE84-014658 ..... N84-32442 #
DE84-014673 ..... N84-32523 #
DE84-014830 ..... N84-32816 #
DE84-014851 ..... N84-33242 #
DE84-014902 ..... N84-32546 #
DE84-014904 ..... N84-32519 #
DE84-014908 ..... N84-33241 #
DE84-014930 ..... N84-33240 #
DE84-023584 ..... N84-33092 #

DMS-DFR-2098 ..... N84-32415* #

DOE/ER-02313/14 ..... N84-32517 #
DOE/ER-02978/11 ..... N84-33170 #
DOE/ER-03054/89 ..... N84-32556 #
DOE/ER-04027/1 ..... N84-32441 #
DOE/ER-04435/10 ..... N84-33239 #
DOE/ER-04471/T2 ..... N84-33200 #
DOE/ER-05223/68 ..... N84-33161 #
DOE/ER-06035/6 ..... N84-32518 #
DOE/ER-10416/5 ..... N84-33238 #
DOE/ER-10421/5 ..... N84-32546 #
DOE/ER-10444/10 ..... N84-33248 #
DOE/ER-10531/T1 ..... N84-32925 #
DOE/ER-10535/T1 ..... N84-33240 #
DOE/ER-10669/2 ..... N84-33160 #
DOE/ER-10753/4 ..... N84-33328 #
DOE/ER-10846/T2 ..... N84-33198 #
DOE/ER-10907/1 ..... N84-32519 #
DOE/ER-10913/3 ..... N84-32458 #
DOE/ER-12064/2 ..... N84-33241 #
DOE/ER-12085/1 ..... N84-32994 #
DOE/ER-13163/3 ..... N84-32841 #
DOE/ER-40039/T1 ..... N84-33167 #
DOE/ER-40048/82-L3 ..... N84-33335 #
DOE/ER-45030/1 ..... N84-32839 #
DOE/ER-45038/1 ..... N84-33237 #
DOE/ER-45043/1 ..... N84-33242 #
DOE/ER-52104/1 ..... N84-33202 #
DOE/ER-60108/2 ..... N84-32466 #

DOE/ET-20356/12 ..... N84-32920* #
DOE/ET-20356/14 ..... N84-32921* #
DOE/ET-20356/15 ..... N84-33299* #
DOE/ET-20356/16 ..... N84-32922* #
DOE/ET-20356/17 ..... N84-33213* #
DOE/ET-27252/T3 ..... N84-32573 #
DOE/ET-27252/T4 ..... N84-32571 #
DOE/ET-27252/T6 ..... N84-32574 #

DOE/FE-15078/1613 ..... N84-32733 #
DOE/FE-60148/T3 ..... N84-32468 #
DOE/FE-60181/72 ..... N84-32432 #

DOE/JPL-1012-98 ..... N84-32683* #
DOE/JPL-1060/66 ..... N84-32915* #
DOE/JPL-1060/71 ..... N84-32916* #
DOE/JPL-1060/72 ..... N84-32917* #
DOE/JPL-1060/74 ..... N84-32918* #
DOE/JPL-1060/75 ..... N84-32919* #

DOE/NASA/0032-23 ..... N84-33307* #
DOE/NASA/0300-1 ..... N84-33304* #
DOE/NASA/0323-1 ..... N84-33309* #
DOE/NASA/0394-1 ..... N84-33306* #

DOE/RA-50420/1 ..... N84-33103 #

DOE/R6-12054/T1 ..... N84-32761 #

DOE/SF-11725/T1 ..... N84-33166 #

DOT-I-83-20 ..... N84-33308 #

DOT-TSC-RSPA-84-1 ..... N84-32374 #

DOT/FAA/CT-84/7 ..... N84-32400 #

DOT/FAA/PM-84/8 ..... N84-32400 #

DOT/RSPA/DMA/50-84/17 ..... N84-32577 #

DPST-83-951 ..... N84-32838 #

DR-3 ..... N84-32808 #

DRD-7 ..... N84-32650* #

DRIC-BR-92075 ..... N84-32806 #

DRL-T-1544-2 ..... N84-32650* #

DTIC/TR-83/2-VOL-1 ..... N84-33291 #
DTIC/TR-83/2-VOL-2 ..... N84-33292 #
DTIC/TR-84/6-VOL-1 ..... N84-33291 #
DTIC/TR-84/6-VOL-2 ..... N84-33292 #

DTNSRDC/CMLD-CR-53-84 ..... N84-32345 #

DTNSRDC/PAS-84-12 ..... N84-32831 #

E-1885 ..... N84-32446* #
E-1993 ..... N84-32536* #
E-2008 ..... N84-32824* #
E-2049 ..... N84-32825* #
E-2050 ..... N84-32388* #
E-2122 ..... N84-32426* #
E-2150 ..... N84-32357* #
E-2162 ..... N84-32644* #
E-2185 ..... N84-32849* #
E-2202 ..... N84-32355* #
E-2213 ..... N84-32508* #
E-2216 ..... N84-32344* #
E-2228 ..... N84-32531* #
E-2259 ..... N84-32427* #
E-2272 ..... N84-32351* #
E-2274 ..... N84-32783* #
E-2281 ..... N84-32789* #
E-2292 ..... N84-32411* #

EGG-M-06584 ..... N84-33300 #

EGG-SCM-6595 ..... N84-32523 #

EL-RN-207 ..... N84-32979 #

EPA-450/4-84-007A ..... N84-32934 #
EPA-450/4-84-007BA ..... N84-32936 #
EPA-450/4-84-007C ..... N84-32935 #
EPA-600/D-84-124 ..... N84-33006 #
EPA-600/D-84-126 ..... N84-33009 #
EPA-600/D-84-157 ..... N84-32906 #
EPA-600/D-84-166 ..... N84-32980 #
EPA-600/D-84/165 ..... N84-32981 #
EPA-600/E-84-125 ..... N84-33010 #
EPA-600/4-84-019 ..... N84-32797 #
EPA-600/4-84-049 ..... N84-32579 #

EPA-600/4-84/050 ..... N84-32798 #
EPA-600/7-84-069A-VOL-1 ..... N84-32469 #
EPA-600/7-84-069B-VOL-2 ..... N84-32470 #

ESN-38-7 ..... N84-33287 #

ETL-0359 ..... N84-32900 #

E84-10024 ..... N84-32892* #
E84-10173 ..... N84-32893* #
E84-10190 ..... N84-32894* #
E84-10191 ..... N84-32895* #

FAA-CT-84-16 ..... N84-32366 #

FAA-EE-84-2 ..... N84-33151 #

FERMILAB-CONF-84/40-T ..... N84-33334 #

FERMILAB/TM-1264 ..... N84-32662 #

FHWA/RD-83/012 ..... N84-32578 #

FHWA/TX-83/9-247-5F ..... N84-32867 #
FHWA/TX-83/24-306-1 ..... N84-32888 #

FMI-NAS-8273 ..... N84-33304* #

FR-683110 ..... N84-32784* #

FSU-STATISTICS-M677 ..... N84-33139 #
FSU-STATISTICS-M678 ..... N84-33132 #

FTD-ID(RS)T-0296-84 ..... N84-32881 #
FTD-ID(RS)T-0717-84 ..... N84-33217 #
FTD-ID(RS)T-0731-84 ..... N84-32362 #
FTD-ID(RS)T-1734-83 ..... N84-33101 #

GA-A-17545 ..... N84-32842 #
GA-A-17593 ..... N84-33197 #

GAO/NSIAD-84-74 ..... N84-33254 #

GAO/RCED-84-14 ..... N84-33294 #
GAO/RCED-84-154 ..... N84-32371 #

GJBX-4-84 ..... N84-32462 #

GL-3712 ..... N84-32809 #

GPO-27-913 ..... N84-32966 #
GPO-28-186 ..... N84-32933 #
GPO-30-599 ..... N84-32897 #
GPO-31-912 ..... N84-32826 #
GPO-33-446 ..... N84-32968 #
GPO-34-202 ..... N84-33301 #
GPO-34-924 ..... N84-33302 #

GRI-84/0012 ..... N84-32575 #
GRI-84/0039 ..... N84-32550 #
GRI-84/0048 ..... N84-32560 #
GRI-84/0070 ..... N84-32576 #

H-1217 ..... N84-32384* #

HEDL-7444 ..... N84-32513 #
HEDL-7451 ..... N84-32465 #

HL-84-23 ..... N84-33145* #
HL-84-24 ..... N84-33146* #

IAF-84-15 ..... N84-32411* #

ICASE-84-22 ..... N84-33107* #
ICASE-84-28 ..... N84-32349* #
ICASE-84-36 ..... N84-33053* #
ICASE-84-37 ..... N84-33113* #
ICASE-84-38 ..... N84-33111* #
ICASE-84-39 ..... N84-33112* #
ICASE-84-40 ..... N84-33108* #
ICASE-84-41 ..... N84-33059* #

IIHR-272 ..... N84-32773 #
IIHR-274 ..... N84-32905 #

INPE-2586-PRE/234 ..... N84-32967 #
INPE-2746-PRE/322 ..... N84-32409 #
INPE-2761-PRE/336 ..... N84-33251 #
INPE-2893-PRE/412 ..... N84-33073 #
INPE-2942-TDL/151 ..... N84-32953 #
INPE-2948-PRE/431 ..... N84-32899 #
INPE-2975-RPE/450 ..... N84-32982 #
INPE-2976-PRE/438 ..... N84-32983 #
INPE-2978-PRE/440 ..... N84-33074 #
INPE-2980-PRE/442 ..... N84-33110 #
INPE-2984-NTE/211 ..... N84-32407 #

INPE-2987-TDL/152 ..... N84-33100 #
INPE-2992-TDL/153 ..... N84-33075 #
INPE-3045-TDL/157 ..... N84-33212 #
INPE-3070-PRE/487 ..... N84-32898 #
INPE-3095-TDL/165 ..... N84-33180 #

IS-M-476 ..... N84-33194 #
IS-M-488 ..... N84-32852 #
IS-M-491 ..... N84-33231 #

ISBN-92-835-0354-6 ..... N84-33011 #
ISBN-92-835-1471-6 ..... N84-32401 #
ISBN-92-835-1473-4 ..... N84-32402 #

ISSN-0091-2972 ..... N84-33282 #
ISSN-0091-2972 ..... N84-33283 #
ISSN-0340-7608 ..... N84-33093 #
ISSN-0340-7608 ..... N84-33189 #
ISSN-0373-0956 ..... N84-33025 #
ISSN-0373-0956 ..... N84-33038 #
ISSN-0385-7719 ..... N84-32565 #

ITR-4 ..... N84-32540 #

JAYCOR-J206-84-008/6220 ..... N84-32711 #

JPL-PUB-80-23-REV-2 ..... N84-32448* #
JPL-PUB-83-101 ..... N84-32915* #
JPL-PUB-84-31 ..... N84-32917* #
JPL-PUB-84-32 ..... N84-32916* #
JPL-PUB-84-35 ..... N84-32921* #
JPL-PUB-84-37 ..... N84-32922* #
JPL-PUB-84-40 ..... N84-32920* #
JPL-PUB-84-41 ..... N84-33213* #
JPL-PUB-84-43 ..... N84-32403* #
JPL-PUB-84-44 ..... N84-32683* #
JPL-PUB-84-46 ..... N84 32919* #

JPL-TDA-PR-42-78 ..... N84-32622* #

JPL-84-36 ..... N84-33299* #
JPL-5101-247 ..... N84-32683* #

JPRS-UBB-84-018 ..... N84-32996 #

JPRS-UEE-84-006 ..... N84-32580 #

JPRS-WST-84-030 ..... N84-33141 #

K/CSD/TM-52 ..... N84-32765 #

L-5552 ..... N84-33147* #
L-15755 ..... N84-32354* #
L-15773 ..... N84-32348* #
L-15807 ..... N84-32378* #
L-15809 ..... N84-32952* #

LA-UR-83-2489 ..... N84-32723 #
LA-UR-83-3085 ..... N84-33068 #
LA-UR-84-889 ..... N84-32514 #
LA-UR-84-904 ..... N84-33232 #
LA-UR-84-905 ..... N84-33233 #
LA-UR-84-1020 ..... N84-33244 #
LA-UR-84-1051 ..... N84-33245 #
LA-UR-84-1052 ..... N84-33243 #
LA-UR-84-1053 ..... N84-32515 #
LA-UR-84-1378 ..... N84-33169 #
LA-UR-84-1490 ..... N84-32557 #
LA-UR-84-1499 ..... N84-33135 #
LA-UR-84-1525 ..... N84-33230 #
LA-UR-84-1561 ..... N84-33086 #
LA-UR-84-1583 ..... N84-33136 #
LA-UR-84-1595 ..... N84-33321* #
LA-UR-84-1717 ..... N84-33122 #
LA-UR-84-1773 ..... N84-32818 #
LA-UR-84-1796 ..... N84-32993 #
LA-UR-84-1981 ..... N84-33311 #
LA-UR-84-2037 ..... N84-32817 #

LA-8862-MS-REV-2 ..... N84-32725 #
LA-10005 ..... N84-33066 #
LA-10029-MS ..... N84-33196 #
LA-10078-MS ..... N84-32769 #

LARS-CR-080984 ..... N84-32893* #

LBL-16804 ..... N84-33235 #
LBL-16890 ..... N84-33159 #
LBL-16979 ..... N84-33192 #
LBL-17196 ..... N84-32726 #
LBL-17220 ..... N84-32464 #
LBL-17222 ..... N84-32459 #
LBL-17237 ..... N84-33247 #
LBL-17277 ..... N84-32520 #
LBL-17448 ..... N84-32995 #
LBL-17649 ..... N84-33327 #

LBL-17681 ..... N84-32767 #
LBL-17742 ..... N84-32930 #
LBL-17776 ..... N84-32731 #
LBL-17910 ..... N84-32521 #

LC-79-640375-PT-1 ..... N84-33329 #
LC-79-640375-PT-2 ..... N84-33330 #
LC-83-600362 ..... N84-32524 #

LCDS-84-8 ..... N84-33117 #

LEMSCO-19346-VOL-5 ..... N84-32416* #
LEMSCO-19346-VOL-6 ..... N84-32414* #

LR-29619 ..... N84-32395* #

MA-RD-770-83067A-VOL-1 ..... N84-32412 #
MA-RD-770-83067B-VOL-2 ..... N84-32413 #

MCR-83-607 ..... N84-33022* #

MEASUREMENT-SER-84-3 ..... N84-33116 #

MIT/LCS-PR-19 ..... N84-33064 #

MIT/LCS/TM-262 ..... N84-32713 #

MIT/LCS/TR-315 ..... N84-33077 #

MLM-3134(OP) ..... N84-32886 #

MPR-6 ..... N84-32780* #
MPR-7 ..... N84-32781* #
MPR-9 ..... N84-32949* #

MRL-R-831 ..... N84-32803 #

MSSU-EIRS-EE-83-6 ..... N84-33097* #

MTI-84ASE356DR3 ..... N84-33307* #

MTR-83W00172-VOL-1 ..... N84-32412 #
MTR-83W00172-VOL-2 ..... N84-32413 #

NADC-82132-60 ..... N84-32396 #

NAS 1.15:83685 ..... N84-32426* #
NAS 1.15:83733 ..... N84-32344* #
NAS 1.15:83739 ..... N84-32357* #
NAS 1.15:83762 ..... N84-32506* #
NAS 1.15:83768 ..... N84-32427* #
NAS 1.15:83775 ..... N84-32644* #
NAS 1.15:83779 ..... N84-32531* #
NAS 1.15:83780 ..... N84-32351* #
NAS 1.15:83781 ..... N84-32783* #
NAS 1.15:83785 ..... N84-32789* #
NAS 1.15:83788 ..... N84-32849* #
NAS 1.15:83795 ..... N84-32411* #
NAS 1.15:84351 ..... N84-32380* #
NAS 1.15:85071 ..... N84-33333* #
NAS 1.15:85536 ..... N84-32681* #
NAS 1.15:85538 ..... N84-33364* #
NAS 1.15:85596 ..... N84-33305* #
NAS 1.15:85765 ..... N84-32348* #
NAS 1.15:85802 ..... N84-32627* #
NAS 1.15:85843 ..... N84-32381* #
NAS 1.15:85873 ..... N84-32393* #
NAS 1.15:85877 ..... N84-32431* #
NAS 1.15:85931 ..... N84-33365* #
NAS 1.15:85959 ..... N84-33106* #
NAS 1.15:85966 ..... N84-32752* #
NAS 1.15:85970 ..... N84-32350* #
NAS 1.15:85980 ..... N84-32358* #
NAS 1.15:86001 ..... N84-32436* #
NAS 1.15:86002 ..... N84-32379* #
NAS 1.15:86019 ..... N84-32753* #
NAS 1.15:86029 ..... N84-32384* #
NAS 1.15:86090 ..... N84-32679* #
NAS 1.15:86127 ..... N84-32621* #
NAS 1.15:86132 ..... N84-33332* #
NAS 1.15:86134 ..... N84-32695* #
NAS 1.15:86139 ..... N84-33317* #
NAS 1.15:86140 ..... N84-33326* #
NAS 1.15:86142 ..... N84-33325* #
NAS 1.15:86147 ..... N84-33320* #
NAS 1.15:86260 ..... N84-32422* #
NAS 1.15:86278 ..... N84-32353* #
NAS 1.15:86279 ..... N84-32365* #
NAS 1.15:86282 ..... N84-32677* #
NAS 1.15:86283 ..... N84-32437* #
NAS 1.15:86287 ..... N84-32435* #
NAS 1.15:86291 ..... N84-32439* #
NAS 1.15:86293 ..... N84-32505* #
NAS 1.15:86294 ..... N84-32508* #
NAS 1.15:86295 ..... N84-32507* #
NAS 1.15:86297 ..... N84-32436* #

NAS 1.15:86451 ..... N84-32788* #
NAS 1.15:86457 ..... N84-33076* #
NAS 1.15:86459 ..... N84-32805* #
NAS 1.15:86462 ..... N84-32629* #
NAS 1.15:86857 ..... N84-32990* #
NAS 1.15:86862 ..... N84-32536* #
NAS 1.21:7011(262 ..... N84-33003*
NAS 1.21:7037(177) N84-32342*
NAS 1.21:7037(178) N84-32343*
NAS 1.21:7039(25)-SECT-2 ..... N84-33257*
NAS 1.26:3833 ..... N84-32355* #
NAS 1.26:3835 ..... N84-32965* #
NAS 1.26:158927 ..... N84-32367* #
NAS 1.26:161963 ..... N84-32749* #
NAS 1.26:166580 ..... N84-32356* #
NAS 1.26:166588 ..... N84-32399* #
NAS 1.26:168234-VOL-1 ..... N84-33148* #
NAS 1.26:168234-VOL-2 ..... N84-33149* #
NAS 1.26:168234-VOL-3 ..... N84-33150* #
NAS 1.26:168255 ..... N84-33304* #
NAS 1.26:168297 ..... N84-32790* #
NAS 1.26:171125 ..... N84-32781* #
NAS 1.26:171126 ..... N84-32780* #
NAS 1.26:171128 ..... N84-32949* #
NAS 1.26:171136 ..... N84-33097* #
NAS 1.26:171732 ..... N84-32416* #
NAS 1.26:171795 ..... N84-32414* #
NAS 1.26:171804 ..... N84-32650* #
NAS 1.26:171805 ..... N84-32535* #
NAS 1.26:171806 ..... N84-33023* #
NAS 1.26:171807 ..... N84-32415* #
NAS 1.26:171808 ..... N84-32707* #
NAS 1.26:171809 ..... N84-32791* #
NAS 1.26:172238 ..... N84-32677* #
NAS 1.26:172322 ..... N84-32367* #
NAS 1.26:172362 ..... N84-32410* #
NAS 1.26:172384 ..... N84-33147* #
NAS 1.26:172393 ..... N84-32784* #
NAS 1.26:172394 ..... N84-32423* #
NAS 1.26:172416 ..... N84-32349* #
NAS 1.26:172417 ..... N84-33107* #
NAS 1.26:172421 ..... N84-33024* #
NAS 1.26:172429 ..... N84-33181* #
NAS 1.26:172430 ..... N84-32397* #
NAS 1.26:172431 ..... N84-33053* #
NAS 1.26:172432 ..... N84-33113* #
NAS 1.26:172433 ..... N84-33111* #
NAS 1.26:172434 ..... N84-33112* #
NAS 1.26:172435 ..... N84-33106* #
NAS 1.26:172436 ..... N84-33059* #
NAS 1.26:173675 ..... N84-32406* #
NAS 1.26:173676 ..... N84-32894* #
NAS 1.26:173832 ..... N84-32377* #
NAS 1.26:173852 ..... N84-32893* #
NAS 1.26:173857 ..... N84-33056* #
NAS 1.26:173868 ..... N84-32678* #
NAS 1.26:173876 ..... N84-32892* #
NAS 1.26:173877 ..... N84-32950* #
NAS 1.26:173878 ..... N84-33315* #
NAS 1.26:173879 ..... N84-32951* #
NAS 1.26:173880 ..... N84-32395* #
NAS 1.26:173881 ..... N84-32352* #
NAS 1.26:173884 ..... N84-32389* #
NAS 1.26:173885 ..... N84-32622* #
NAS 1.26:173886 ..... N84-33319* #
NAS 1.26:173887 ..... N84-33316* #
NAS 1.26:173888 ..... N84-33210* #
NAS 1.26:173889 ..... N84-33310* #
NAS 1.26:173890 ..... N84-33022* #
NAS 1.26:173891 ..... N84-32662* #
NAS 1.26:173892 ..... N84-32663* #
NAS 1.26:173893 ..... N84-32403* #
NAS 1.26:173896 ..... N84-32915* #
NAS 1.26:173897 ..... N84-33213* #
NAS 1.26:173898 ..... N84-32920* #
NAS 1.26:173899 ..... N84-32448* #
NAS 1.26:173900 ..... N84-33299* #
NAS 1.26:173901 ..... N84-32921* #
NAS 1.26:173903 ..... N84-32922* #
NAS 1.26:173904 ..... N84-32916* #
NAS 1.26:173905 ..... N84-32986* #
NAS 1.26:173906 ..... N84-33295* #
NAS 1.26:173907 ..... N84-32682* #
NAS 1.26:173908 ..... N84-32918* #
NAS 1.26:173909 ..... N84-33285* #
NAS 1.26:173910 ..... N84-32917* #
NAS 1.26:173911 ..... N84-32919* #
NAS 1.26:173913 ..... N84-33020* #
NAS 1.26:173914 ..... N84-33322* #
NAS 1.26:173915 ..... N84-33145* #
NAS 1.26:173916 ..... N84-32645* #
NAS 1.26:173917 ..... N84-33146* #
NAS 1.26:173918 ..... N84-32683* #
NAS 1.26:173919 ..... N84-33323* #
NAS 1.26:173920 ..... N84-33105* #
NAS 1.26:173921 ..... N84-33071* #

NAS 1.26:173923 ..... N84-33321* #
NAS 1.26:173924 ..... N84-32502* #
NAS 1.26:174674 ..... N84-33307* #
NAS 1.26:174686 ..... N84-32503* #
NAS 1.26:174690 ..... N84-33309* #
NAS 1.26:174691 ..... N84-32504* #
NAS 1.26:174702 ..... N84-32428* #
NAS 1.26:174703 ..... N84-32429* #
NAS 1.26:174706 ..... N84-32628* #
NAS 1.26:174755 ..... N84-33306* #
NAS 1.26:174759 ..... N84-32751* #
NAS 1.26:174760 ..... N84-32390* #
NAS 1.26:174761 ..... N84-32552* #
NAS 1.26:175251 ..... N84-32948* #
NAS 1.26:175252 ..... N84-32405* #
NAS 1.26:175253 ..... N84-32802* #
NAS 1.26:175254 ..... N84-33178* #
NAS 1.26:175255 ..... N84-32896* #
NAS 1.26:175257 ..... N84-32404* #
NAS 1.26:175258 ..... N84-32534* #
NAS 1.26:175259 ..... N84-32785* #
NAS 1.26:175260 ..... N84-32750* #
NAS 1.26:175261 ..... N84-32646* #
NAS 1.26:175262 ..... N84-32647* #
NAS 1.26:175263 ..... N84-32648* #
NAS 1.26:175264 ..... N84-32649* #
NAS 1.55:2318 ..... N84-32952* #
NAS 1.55:2323 ..... N84-33266* #
NAS 1.55:2328 ..... N84-32864* #
NAS 1.60:2309 ..... N84-32388* #
NAS 1.60:2320 ..... N84-32446* #
NAS 1.60:2326 ..... N84-32394* #
NAS 1.60:2333 ..... N84-32354* #
NAS 1.60:2353 ..... N84-32378* #
NAS 1.60:2367 ..... N84-32824* #
NAS 1.60:2368 ..... N84-32825* #
NAS 1.71:ARC-11534-1 ..... N84-33021* #
NAS 1.71:LAR-12518-1 ..... N84-32383* #
NAS 1.71:LAR-13147-1 ..... N84-32787* #
NAS 1.71:LAR-13220-1 ..... N84-32786* #
NAS 1.71:LAR-13257-1 ..... N84-32447* #
NAS 1.71:LAR-13270-1 ..... N84-32532* #
NAS 1.71:LEW-13773-2 ..... N84-32782* #
NAS 1.71:LEW-14028-1 ..... N84-32909* #
NAS 1.71:LEW-14037-1 ..... N84-32425* #
NAS 1.71:MFS-25868-1 ..... N84-32680* #
NAS 1.71:MFS-25905-2 ..... N84-32569* #
NAS 1.71:MFS-25962-1 ..... N84-32396* #
NAS 1.71:MFS-25978-1 ..... N84-32913* #
NAS 1.71:MSC-20148-1 ..... N84-32823* #
NAS 1.71:MSC-20635-1 ..... N84-32424* #
NAS 1.71:MSC-20812-1 ..... N84-32748* #
NAS 1.71:NPO-15419-2 ..... N84-32910* #
NAS 1.71:NPO-16045-1 ..... N84-33211* #
NAS 1.71:NPO-16103-1 ..... N84-32530* #
NAS 1.71:NPO-16126-1 ..... N84-32911* #
NAS 1.71:NPO-16256-1 ..... N84-32620* #
NAS 1.71:NPO-16294-1 ..... N84-33179* #
NAS 1.71:NPO-16392-1 ..... N84-32912* #

NASA-CASE-ARC-11534-1 ..... N84-33021* #

NASA-CASE-LAR-12518-1 ..... N84-32383* #
NASA-CASE-LAR-13147-1 ..... N84-32787* #
NASA-CASE-LAR-13220-1 ..... N84-32786* #
NASA-CASE-LAR-13257-1 ..... N84-32447* #
NASA-CASE-LAR-13270-1 ..... N84-32532* #

NASA-CASE-LEW-13773-2 ..... N84-32782* #
NASA-CASE-LEW-14028-1 ..... N84-32909* #
NASA-CASE-LEW-14037-1 ..... N84-32425* #

NASA-CASE-MFS-25868-1 ..... N84-32680* #
NASA-CASE-MFS-25905-2 ..... N84-32569* #
NASA-CASE-MFS-25962-1 ..... N84-32396* #
NASA-CASE-MFS-25978-1 ..... N84-32913* #

NASA-CASE-MSC-20148-1 ..... N84-32823* #
NASA-CASE-MSC-20635-1 ..... N84-32424* #
NASA-CASE-MSC-20812-1 ..... N84-32748* #

NASA-CASE-NPO-15419-2 ..... N84-32910* #
NASA-CASE-NPO-16045-1 ..... N84-33211* #
NASA-CASE-NPO-16103-1 ..... N84-32530* #
NASA-CASE-NPO-16126-1 ..... N84-32911* #
NASA-CASE-NPO-16256-1 ..... N84-32620* #
NASA-CASE-NPO-16294-1 ..... N84-33179* #
NASA-CASE-NPO-16392-1 ..... N84-32912* #

NASA-CP-2318 ..... N84-32952* #
NASA-CP-2323 ..... N84-33266* #
NASA-CP-2328 ..... N84-32864* #

NASA-CR-3633 ..... N84-32355* #
NASA-CR-3635 ..... N84-32965* #
NASA-CR-158927 ..... N84-32367* #

NASA-CR-161963 ..... N84-32749* #
NASA-CR-166560 ..... N84-32356* #
NASA-CR-166588 ..... N84-32399* #
NASA-CR-168234-VOL-1 ..... N84-33148* #
NASA-CR-168234-VOL-2 ..... N84-33149* #
NASA-CR-168234-VOL-3 ..... N84-33150* #
NASA-CR-168256 ..... N84-33304* #
NASA-CR-168297 ..... N84-32790* #
NASA-CR-171125 ..... N84-32781* #
NASA-CR-171126 ..... N84-32780* #
NASA-CR-171128 ..... N84-32949* #
NASA-CR-171136 ..... N84-33097* #
NASA-CR-171732 ..... N84-32416* #
NASA-CR-171795 ..... N84-32414* #
NASA-CR-171804 ..... N84-32650* #
NASA-CR-171805 ..... N84-32535* #
NASA-CR-171806 ..... N84-33023* #
NASA-CR-171807 ..... N84-32415* #
NASA-CR-171808 ..... N84-32707* #
NASA-CR-171809 ..... N84-32791* #
NASA-CR-172238 ..... N84-32677* #
NASA-CR-172322 ..... N84-32387* #
NASA-CR-172362 ..... N84-32410* #
NASA-CR-172384 ..... N84-33147* #
NASA-CR-172393 ..... N84-32784* #
NASA-CR-172394 ..... N84-32423* #
NASA-CR-172416 ..... N84-32349* #
NASA-CR-172417 ..... N84-33107* #
NASA-CR-172421 ..... N84-33024* #
NASA-CR-172429 ..... N84-33181* #
NASA-CR-172430 ..... N84-32397* #
NASA-CR-172431 ..... N84-33053* #
NASA-CR-172432 ..... N84-33113* #
NASA-CR-172433 ..... N84-33111* #
NASA-CR-172434 ..... N84-33112* #
NASA-CR-172435 ..... N84-33108* #
NASA-CR-172436 ..... N84-33059* #
NASA-CR-173675 ..... N84-32406* #
NASA-CR-173676 ..... N84-32694* #
NASA-CR-173832 ..... N84-32377* #
NASA-CR-173852 ..... N84-32693* #
NASA-CR-173857 ..... N84-33056* #
NASA-CR-173866 ..... N84-32678* #
NASA-CR-173876 ..... N84-32692* #
NASA-CR-173877 ..... N84-32950* #
NASA-CR-173878 ..... N84-33315* #
NASA-CR-173879 ..... N84-32951* #
NASA-CR-173880 ..... N84-32395* #
NASA-CR-173881 ..... N84-32352* #
NASA-CR-173884 ..... N84-32389* #
NASA-CR-173885 ..... N84-32622* #
NASA-CR-173886 ..... N84-33319* #
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NASA-CR-174686 ..... N84-32503* #
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NASA-SP-7011(262) N84-33003*
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NASA-TM-86457 ..... N84-33076* #
NASA-TM-86459 ..... N84-32805* #
NASA-TM-86462 ..... N84-32829* #
NASA-TM-86857 ..... N84-32990* #
NASA-TM-86862 ..... N84-32536* #

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NASA-TP-2326 ..... N84-32394* #
NASA-TP-2333 ..... N84-32354* #
NASA-TP-2353 ..... N84-32378* #
NASA-TP-2367 ..... N84-32824* #
NASA-TP-2368 ..... N84-32825* #

NBDL-84R002 ..... N84-32793 #

NBS-FIPS-PUB-60-2 ..... N84-33057 #

NBS/MONO-172 ..... N84-33297 #

NCAR/TN-227 ..... N84-32977 #
NCAR/TN-232 ..... N84-33094 #

NCEL-TN-1601 ..... N84-32543 #
NCEL-TN-1606 ..... N84-32923 #

NLM-TSD-84-01 ..... N84-33296 #

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NOAA-TM-ERL-PMEL-53 ..... N84-32988 #

NOAA-TM-ERL-SEL-67 ..... N84-32665 #

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NOAA-84060503-PT-2 ..... N84-33330 #
NOAA-84061103 ..... N84-32669 #
NOAA-84061104 ..... N84-32988 #
NOAA-84061107 ..... N84-32978 #
NOAA-84061401 ..... N84-32979 #

NORDA-TN-273 ..... N84-32985 #

NOSC/TR-950 ..... N84-33114 #

NPS-61-84-006 ..... N84-33155 #
NPS-61-84-010 ..... N84-32657 #

NPS69-84-001 ..... N84-32970 #

NRL-MR-5345 ..... N84-33191 #
NRL-MR-5355 ..... N84-33183 #
NRL-MR-5357 ..... N84-32553 #
NRL-MR-5363 ..... N84-33190 #
NRL-MR-5369 ..... N84-32654 #
NRL-MR-5370 ..... N84-32851 #
NRL-MR-5371 ..... N84-33250 #
NRL-MR-5375 ..... N84-32984 #

NRL-8800 ..... N84-32972 #
NRL-8827 ..... N84-33129 #
NRL-8828 ..... N84-32792 #

NSF/PRA-83046 ..... N84-33256 #
NSF/PRA-83047-APP ..... N84-33255 #

NTIA/REPT-84/143 ..... N84-32667 #
NTIA/REPT-84/148 ..... N84-32666 #

NTIS/REPT-84/147 ..... N84-33069 #

NTSB-AAR-84-07 ..... N84-32368 #

NUSC-TD-7183 ..... N84-33152 #

NYSERDA-84-10 ..... N84-32932 #

ONRL-R-7-84 ..... N84-33289 #

ORNL/CON-159 ..... N84-32763 #

ORNL/TM-8183 ..... N84-33089 #
ORNL/TM-9075 ..... N84-33204 #
ORNL/TM-9127 ..... N84-33193 #
ORNL/TM-9133 ..... N84-33195 #
ORNL/TM-9213 ..... N84-32661 #

OSD/FSTC-83/017 ..... N84-33095 #

OSU-FPRC-A5/84 ..... N84-32850 #

OWRT-A-058-LA(1) ..... N84-32904 #
OWRT-A-065-MD(1) ..... N84-32967 #

P-6977 ..... N84-33137 #

PAL-84-32 ..... N84-33020* #

PB84-184621 ..... N84-32412 #
PB84-184639 ..... N84-32413 #
PB84-187244 ..... N84-32577 #
PB84-189729 ..... N84-32374 #
PB84-190115 ..... N84-32904 #
PB84-190206 ..... N84-32987 #
PB84-190602 ..... N84-33008 #
PB84-191220 ..... N84-33094 #
PB84-194661 ..... N84-33138 #
PB84-194885 ..... N84-32665 #
PB84-195155 ..... N84-33067 #
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PB84-212679 ..... N84-32469 #
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PB84-215268 ..... N84-32576 #
PB84-215276 ..... N84-32550 #
PB84-910407 ..... N84-32368 #
PB85-102135 ..... N84-32348* #

PHM-TR-83-01 ..... N84-32957 #
PHM-TR-84-03 ..... N84-32956 #

PNL-SA-12161 ..... N84-33090 #
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PNL-SA-12245 ..... N84-32772 #
PNL-SA-12287 ..... N84-33166 #

PNL-4895 ..... N84-32974 #
PNL-4900 ..... N84-32914 #
PNL-5112 ..... N84-32791* #

PSI-FR-21-167 ..... N84-33157 #

PUB-LAW-98-361 ..... N84-33303 #

PWA-5574-175 ..... N84-32504* #
PWA-5594-142 ..... N84-32389* #
PWA-5914-21 ..... N84-32790* #

R-84-2 ..... N84-33138 #

RADC-TR-84-11 ..... N84-32656 #
RADC-TR-84-16 ..... N84-33218 #
RADC-TR-84-59 ..... N84-32652 #

RAE-TRANS-2113 ..... N84-32804 #
RAE-TRANS-2118 ..... N84-33004 #

RAND/N-2115 ..... N84-33284 #
RAND/N-2121-PSSP ..... N84-33124 #
RAND/N-2131-NSF ..... N84-33286 #

REPT-82-219 ..... N84-33227 #
REPT-84F0267 ..... N84-32679* #
REPT-101-43-16 ..... N84-32900 #
REPT-0226-13 ..... N84-33145* #
REPT-0226-14 ..... N84-33146* #
REPT-5105-130 ..... N84-32917* #

RFP-3638 ..... N84-32420 #

RLE-PR-126 ..... N84-33336 #

RSG-PG-P40629 ..... N84-32650* #

RSRE-MEMO-3670 ..... N84-32806 #

R82AEB491-VOL-1 ..... N84-33148* #
R82AEB491-VOL-2 ..... N84-33149* #
R82AEB491-VOL-3 ..... N84-33150* #
R83AEB637 ..... N84-32714 #

R84-956393-8 ..... N84-32355* #

SAI-84-02-157 ..... N84-33006 #

SAND-83-2171C ..... N84-32547 #
SAND-83-2301/2 ..... N84-32732 #
SAND-83-2358C ..... N84-32770 #
SAND-83-2496C ..... N84-33085 #
SAND-84-0095C ..... N84-33164 #
SAND-84-0244C ..... N84-32931 #
SAND-84-0248C ..... N84-32796 #
SAND-84-0269C ..... N84-32735 #
SAND-84-0353C ..... N84-32461 #
SAND-84-0479C ..... N84-33134 #
SAND-84-0485C ..... N84-32558 #
SAND-84-0703 ..... N84-32927 #
SAND-84-0812 ..... N84-33123 #
SAND-84-0972 ..... N84-32572 #
SAND-84-0982C ..... N84-32734 #
SAND-84-1082C ..... N84-32460 #
SAND-84-1120 ..... N84-32885 #
SAND-84-1297C ..... N84-32883 #
SAND-84-7001 ..... N84-32363 #
SAND-84-7105 ..... N84-32736 #

SASR-5 ..... N84-32389* #
SASR-14 ..... N84-32951* #

SC5368.2FR ..... N84-32539 #

SD-TR-83-72 ..... N84-32710 #
SD-TR-84-16 ..... N84-32954 #

SERI/CP-252-2026 ..... N84-32929 #

SERI/TP-212-2323 ..... N84-32926 #

SGD-475-PT-1 ..... N84-33329 #
SGD-475-PT-2 ..... N84-33330 #

SORI-EAS-82-434-VOL-1 ..... N84-32469 #

SR-1 ..... N84-32419 #
SR-2 ..... N84-32653 #

SRI-4905 ..... N84-32345 #

SR83-R-4861-45 ..... N84-32575 #

SSRL-84/04 ..... N84-33234 #

SU-SLAC-PUB-3357 ..... N84-33165 #

SU-SLAC-TN-84-5 ..... N84-32727 #

SU-SLAC/AP-22 ..... N84-33140 #

SU-SOL-84-3 ..... N84-33092 #

SWRI-01-6745 ..... N84-32366 #

TR-D-66-ARO ..... N84-33139 #

TR-DG-08-ONR ..... N84-33293 #

TR-1 ..... N84-32452 #
TR-1 ..... N84-32539 #
TR-2 ..... N84-32539 #
TR-3 ..... N84-32539 #
TR-3 ..... N84-33224 #
TR-4 ..... N84-32539 #
TR-5 ..... N84-33184 #
TR-6 ..... N84-32454 #
TR-10 ..... N84-32449 #
TR-10 ..... N84-33128 #
TR-11 ..... N84-32536 #
TR-12 ..... N84-32450 #
TR-13 ..... N84-33215 #
TR-14 ..... N84-32451 #
TR-30-PT-1 ..... N84-32973 #
TR-52 ..... N84-33226 #
TR-79 ..... N84-32987 #
TR-83-9 ..... N84-32961 #
TR-84-1 ..... N84-32712 #
TR-205 ..... N84-33133 #
TR-257-SER-2 ..... N84-33126 #
TR-259-SER-2 ..... N84-33125 #
TR-259-SER-2 ..... N84-33127 #
TR-346 ..... N84-33130 #
TR-347 ..... N84-33115 #
TR-0084(4935-10)-1 ..... N84-32710 #
TR-0084(4940-05)-2 ..... N84-32954 #
TR-0884-8211-VOL-1 ..... N84-32646* #
TR-0884-8211-VOL-2 ..... N84-32647* #
TR-0884-8211-VOL-3 ..... N84-32648* #
TR-0884-8211-VOL-4 ..... N84-32649* #

TR-1395 ..... N84-33081 #

TRW-38603-6009-UT-00 ..... N84-32828* #

U-OF-IOWA-84-14 ..... N84-32406* #

UCID-20054 ..... N84-32664 #
UCID-20116 ..... N84-32816 #

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UCRL-15607 ..... N84-33091 #
UCRL-89552 ..... N84-32801 #
UCRL-90053 ..... N84-32975 #
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UCRL-90604 ..... N84-32548 #
UCRL-90662 ..... N84-32768 #
UCRL-90784 ..... N84-32663 #
UCRL-90927 ..... N84-33201 #

UDR-TM-84-14 ..... N84-32510 #
UDR-TM-84-20 ..... N84-32511 #

UILU-ENG-84-1719 ..... N84-33087 #
UILU-ENG-84-2548 ..... N84-32807 #

UIUCDCS-R-84-1169 ..... N84-33087 #

UMTA-URT-41-83-11 ..... N84-33067 #

UMTRI-84-8 ..... N84-32742 #

US-PATENT-APPL-SN-053465 ..... N84-32364
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US-PATENT-APPL-SN-549379 ..... N84-32737 #
US-PATENT-APPL-SN-549382 ..... N84-32739 #
US-PATENT-APPL-SN-550697 ..... N84-32549 #
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